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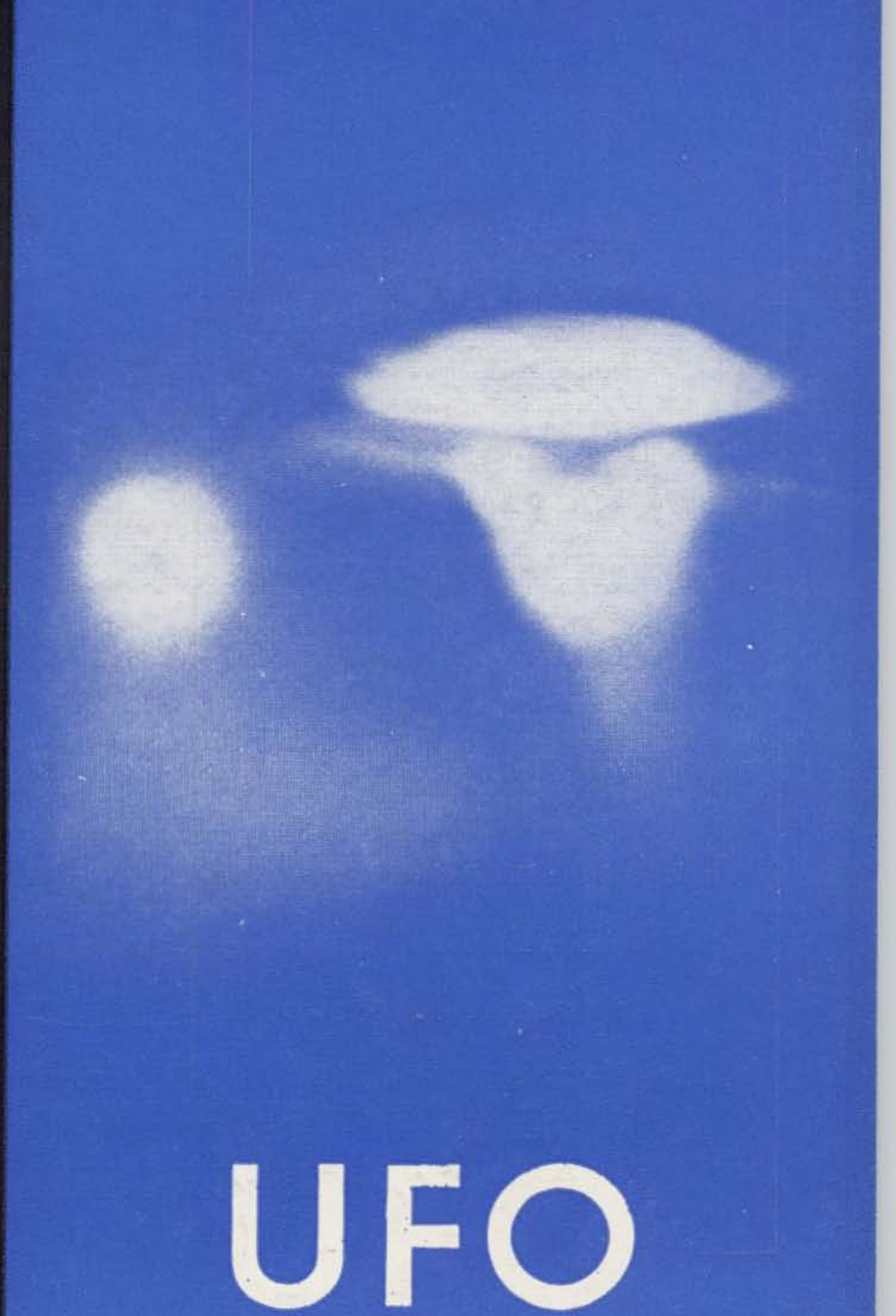

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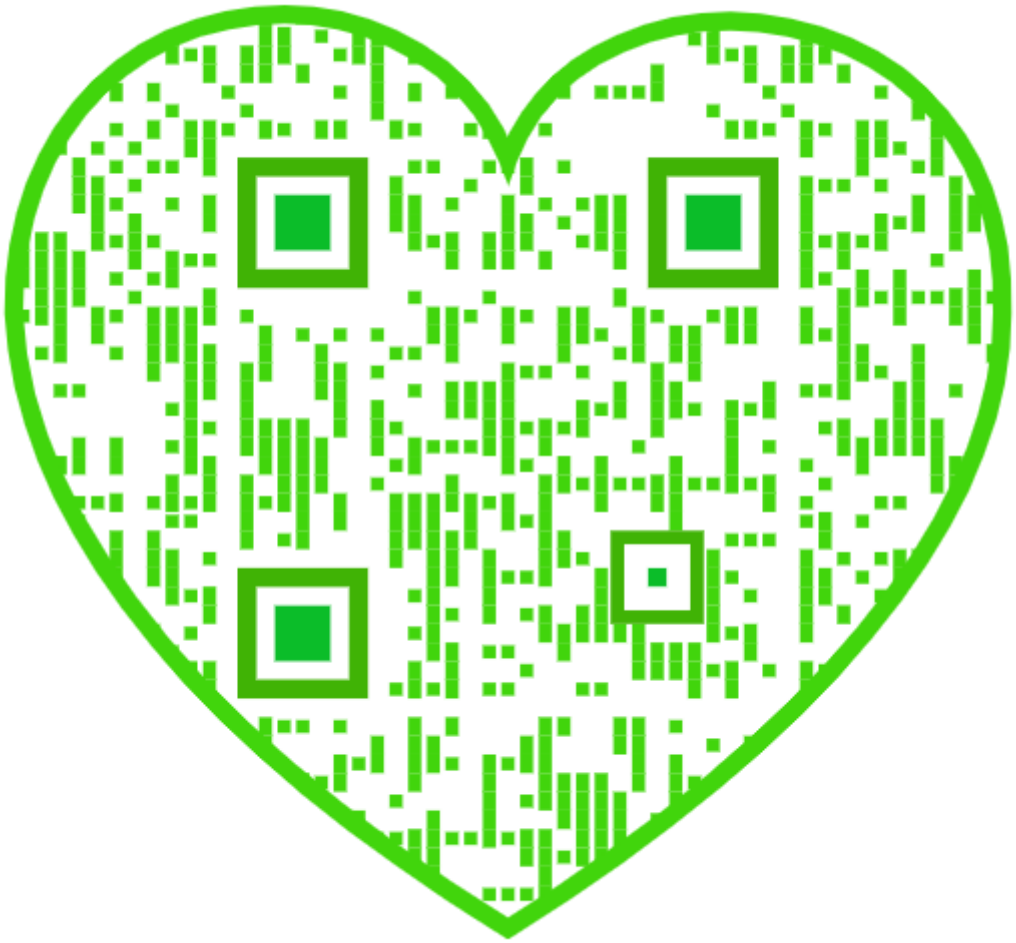

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April 1968
Vol. XLVII No. 4

73 MAGAZINE

Peterborough, New Hampshire 03458

6 **The Vidicon Minicamera** W8TYY
Using low cost high quality semi-conductors
15 **The Little Gem Fuse Tester** W7CSD
There's still time to use this one April 1st
16 **Methods of Transceiver CW Switching** W1DCG
Six circuits to achieve easy CW operation
20 **The Polar Key** K4YWS
Home-brew keyer using inexpensive polar relay
22 **Checking Your VSWR Indicator** W5EHC
Are you sure your SWR bridge is trustworthy?
24 **Video Mixing Amplifiers** W8VCO
Producing a good composite video signal
30 **A Solid Dead Man** WA1ABP
Don't let the wind get your tower down
32 **VHF Operation by Remote Control** W6MVH
Q5 S9 from any location
42 **An Invisible Antenna** W1EMV
A New Antenna theory
44 **Using Your Electromagnetic Wave** WA5HPV
Communication as it should be
46 **ITV Got You Down?** WA7CSK
Getting rid of the Buzz-Saw
48 **The YF Fights Back** WA6SPT
If you can't lick 'em, join 'em
50 **A Career in Electronic Engineering** W6JTT
Areas where engineers are needed
52 **What is YOUR "Amateur Q?"** K3STU
How well do you know the FCC regulations?
56 **And They Called "Mother Shipton" Crazy** K4FQU
Remarkably prophesy from 500 years ago
58 **Recovering "Lost" QSLs** K6UMV
Helping the Post Office help you
60 **Project MOONRAY**
Amateur radio on the Moon in 1970
64 **Audio SSB** K6ICU
A new use for an AFSK oscillator
66 **Installing a Transceiver in a Rented Car** G3BID
Wonder if Hertz would approve?
70 **Preventive Maintenance** K3KMO
Curing problems before they start
73 **You Can Pass The Extra** K6YA
Or so the man says
74 **Use of Q-Multiplier to Increase Intelligibility of Received Voice Signals** ..... Ives
76 **Crystal Etching Tips** W4AYV
86 **Take Uncle Alf's Advice** W6NIF
Uncle Alf talks about coax baluns

Departments
Editorial Liberties 2
De W2NSD/1 4
Propagation 83

Cover: UFO Photo courtesy of National Investigations Committee on Aerial Phenomena

Kayla Bloom W1EMV
Editor

Wayne Green W2NSD/1
Publisher

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Editorial Liberties

I have avoided the subject of incentive licensing, partly because I was too cowardly to rock the boat, but mainly to give myself time to sort out my own thinking on the subject.

Being firmly convinced that some portion of each person's day (ham radio or not) should be devoted to a learning process, I can find little to argue in the final act as it was passed. It will certainly do us no harm to increase our technical ability. I seriously doubt that it will have any major effect on operating tactics or improvement of the conditions of the bands as they now exist, however. For example, one does not have to be an automobile mechanic to be an excellent driver. Nor does FAA require that a pilot be an airplane mechanic before he can be qualified to fly. I know many "appliance operators" who are superb amateur operators, and many skilled electronic engineers who cannot zero a frequency adequately, although they can keep their own and other's rigs in good running condition. What the long term effect on operating techniques will be remains to be seen.

To me, and I'm sure to most of us, the term incentive means working harder to achieve more privileges. This is like the man who is hired for a job at $150 per week and has the opportunity to work harder to make $200 per week. He has the option of staying where he is and keeping his $150 if he so desires. However, with incentive licensing as it now exists, we have the situation of the man who has been making $200 per week for many years suddenly being cut to $150 per week and now has the "incentive?" to work harder to get back to the previous status.

Then, let's look at the "grandfather clause" for the Advanced class holders. In 1965, in a proposed amendment to Amateur Radio Service Rules (March 31, 1966), the FCC officially stated, *"There no longer exists any valid distinction between the Advanced and General Class as to the difficulty of the examination."* However, the holder of the Advanced Class license now gets additional frequencies under the new regulations, although he may not have taken an examination in 40 years. There is always the argument that these people have learned theory through practice in building and maintaining equipment throughout the years. While this may be true, in many cases, it cannot hold for all the old timers any more than saying that none of the General Class holders has done any building simply because commercial equipment has been available to them.

But let us defer to age, and accept this gesture. There still remains, within the Advanced grandfathering, one inequity. Let's cite two hypothetical amateurs. Ham "A" was licensed 40 years ago with what was then called a standard Amateur Radio Station License. A few years later he took a new exam and received what was called an Amateur Extra First Class License. Came the thirties with the depression, and for financial reasons he was unable to indulge in the luxury of a hobby. He was too busy scrounging a living for his family to be on the air. Knowing he would be inactive, he let his license lapse. For a variety of reasons, he was unable to return to amateur radio until 1953. At that time there was no longer any Advanced Class license, so he took the General exam and returned to the air.

Meantime, ham "B" was licensed at the same time and took the same original two exams. He was also inactive for the same period of time, but kept renewing his license throughout the years. Although "B" has not taken any exam since 1928, he holds the Advanced license with all the additional privileges, while "A", who has taken an additional modern examination which, by the FCC's own admission, eliminates any difference between the two classes, has a General.

I would like to suggest that the FCC give serious consideration to allowing one who once held an Advanced Class license which expired, and who has taken the General exam in recent years, to be granted the Advanced license with all the benefits which go along with it.

. . . W1EMV

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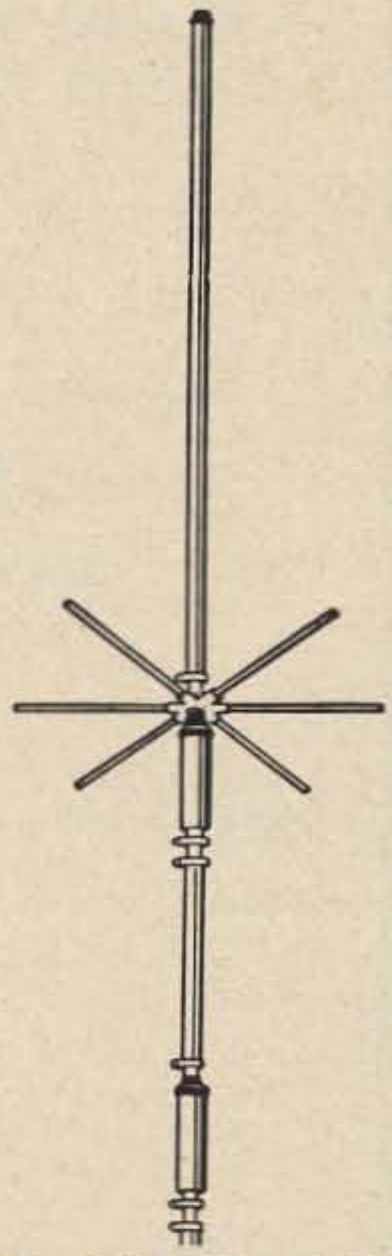

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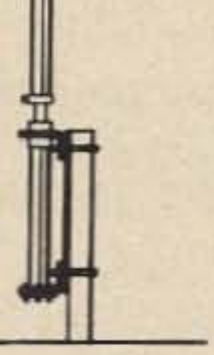

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Can Amateur Radio Help Solve the UFO Problem?

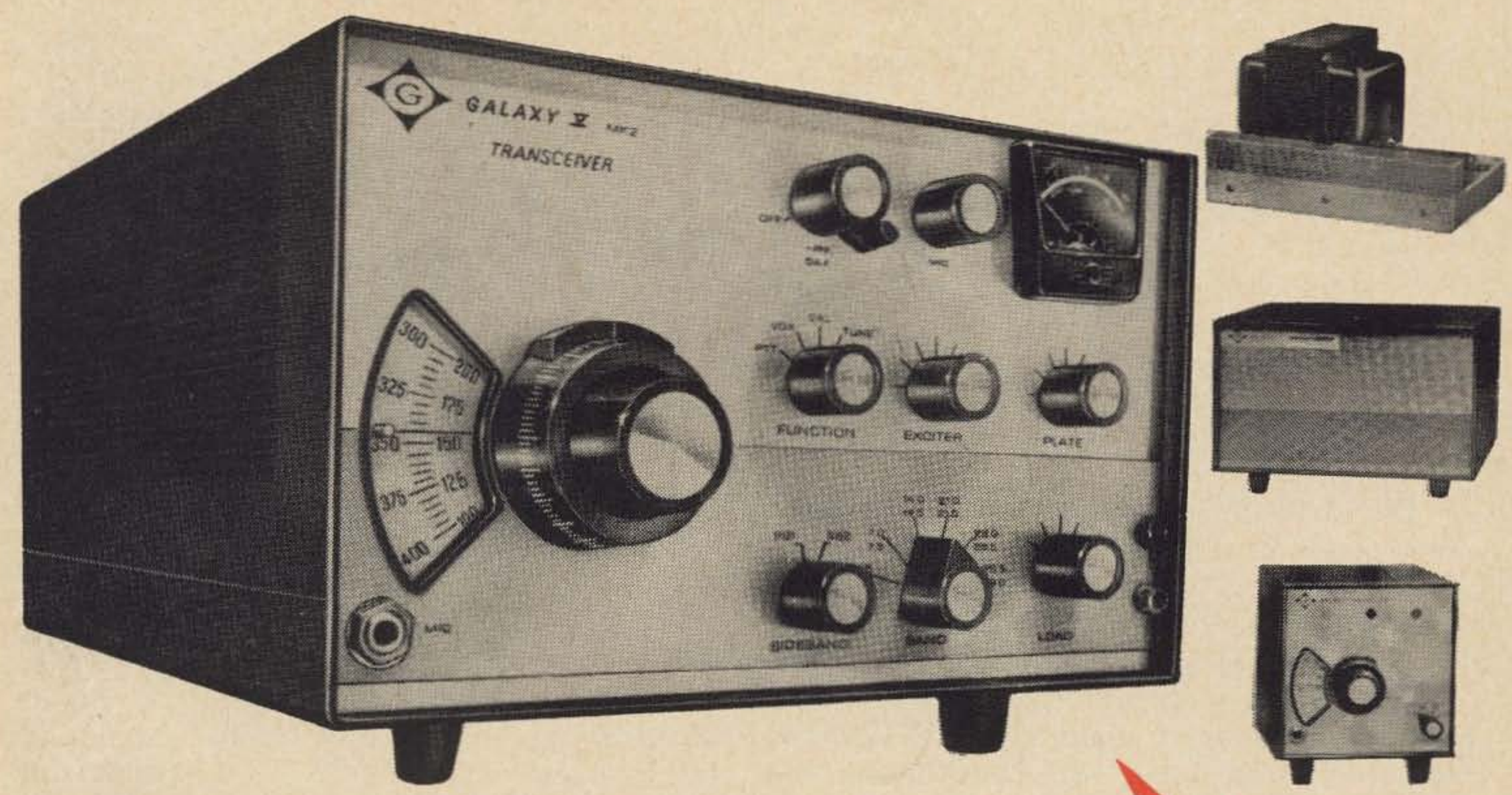
If the UFO's are, as many believe, space craft visiting our planet, can you think of a more important event of our times? Fortunately for us the problems facing UFO investigators can be solved by amateur radio. One single amateur, providing leadership at this time, might do more for the human race than a president or king.

A number of good UFO books have been published recently and those of you who have digested them probably feel about as I do. The mere fact of thousands of identical reports from all over the world by people who could not possibly have cooked up these things previously indicates the truth of the reports. The credibility gap being what it is these days, the poo-pooing of UFO's by our government is also a strong endorsement of their existance. Something is there and we should be doing everything in our power to find out more about it.

Those of you who are familiar with the developing story of the UFO's realize that so far the government investigations of sightings have always been for the purpose of proving them non-existant. So far there has not been one single government attempt to scientifically investigate the UFO phenomenon. If instead of sending out an occasional investigator to talk with someone who has reported a sighting they would organize a team or two of scientists and rush them to the area of a sighting with the idea of taking pictures of the UFO's while they are still there and checking for radiation, magnetic variations, electrostatic fields, etc., we might start to learn something about them.

The obvious problem here is to set up a network which will enable scientific teams to know immediately where a UFO has been spotted and where it is heading. Frankly I can't think of anything other than amateur radio that could fill the bill. You need something that is ubiquitous, reaching into every community. Telephones do this, but imagine the cost and complexity of trying to set up a national network of phones for instant communications! Thousands of amateurs can all listen on one frequency and hear any

(*Turn to page* 84)



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The Vidicon Minicamera

The availability of low-cost high-quality semi-conductors has permitted the design and construction of a small, efficient, stable CCTV vidicon type camera at moderate cost.

The camera to be described has been used primarily for ATV, however, many other uses suggest themselves. Since this camera requires only 12 volts, it can be used in mobile or remote work where no 115 V 60 Hz power is available. This unit features field effect transistor imput for low-noise video, unijunction sweep oscillators for reliability and simplicity, sync inputs, 6 MHz band-width, built-in mechanical focus, and low input power requirements. The total power input is only 3 watts!

To aid in construction and operation of the camera, and to get an idea what makes it work, we will delve lightly into the circuit operation within the camera.

Circuit Description

Video amplifiers

The vidicon target current fluctuations, which comprise the video signal, are impressed across R 1, which serves as the vidicon load. Since the gate circuit of Q 1 is a very high impedance network, the gate receives a relatively high voltage signal (approximately 200 mV). Q 1 is connected as a source follower, which provides low impedance drive for the base of Q 2.

Due to the stray capacitance associated with the target of V 1 and input to Q 1, the video response will start to fall off around 15 KHz and continue to drop at an rc rate (6 dB/octave). Q 2 has a frequency response which is complimentary to the input response, thereby giving flat over-all video response. This is accomplished by controlled emitter degeneration at low frequencies. C 3 sets the breakpoint of the peaking stage (Q 2).

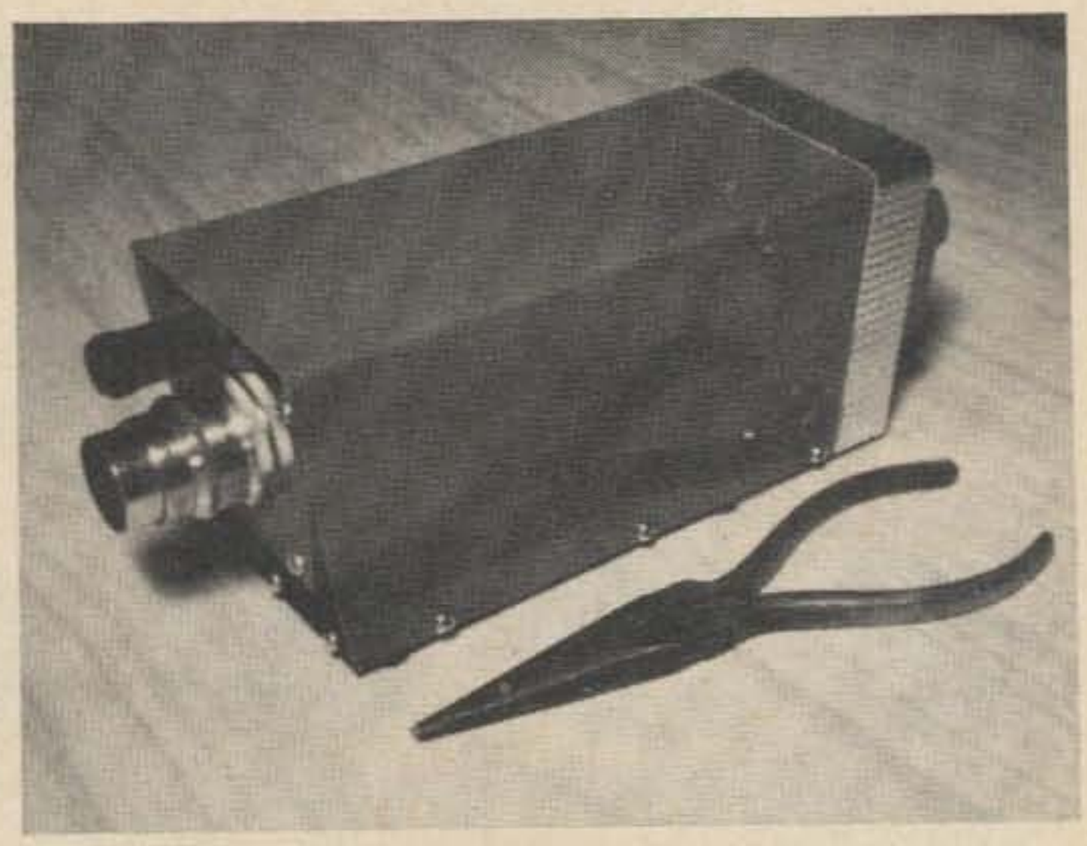
Q 3 is an emitter follower, which prevents the output stages from loading the peaking stage. R 6 adjusts overall video gain. Q 4 is the keyed clamp. When Q 4 receives a pulse from the vidicon blanking circuit, Q 4 conducts, clamping the input of Q 5 to a level determined primarily by the setting of R 27. R 27 therefore controls the blanking level.

Q 5, Q 6, and Q 7 comprise an output feedback amplifier with a gain of approximately 35 and low output impedance to drive the 75 ohm video line.

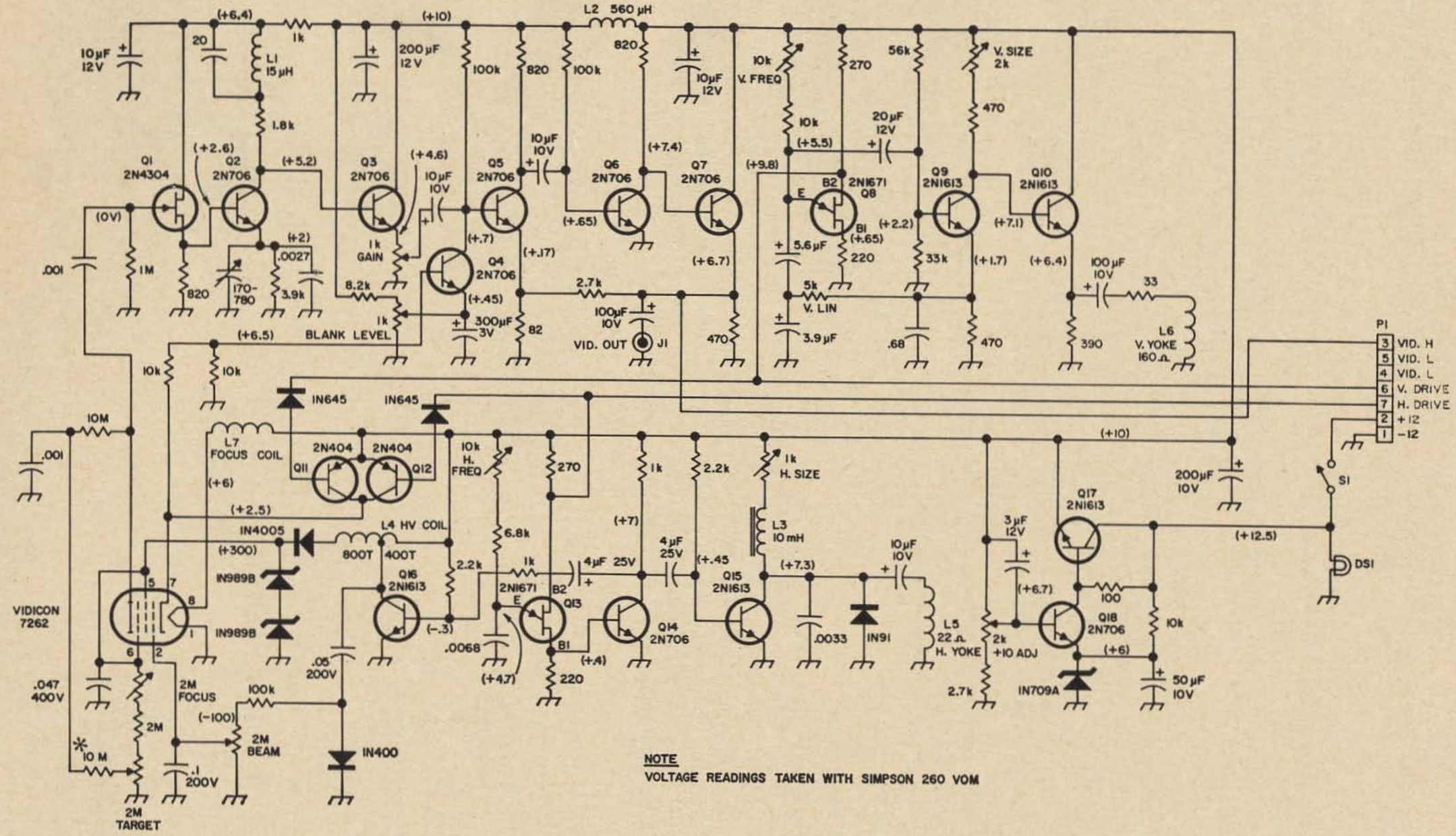
Vertical deflection

The vertical sweep system utilizes a unijunction transistor Q 8, as the frequency generator. This type of device is very useful as a relaxation oscillator due to the fact that when the emitter voltage rises to a fixed percentage of the voltage between the two bases, the unit will suddenly conduct. All that is necessary to construct a relaxation oscillator is to provide an rc charging circuit for the emitter. In our camera, this circuit consists of R 14, R 15, C11 and C 12.

C 11 and C 12 charge toward the supply



The completed camera



NOTE
VOLTAGE READINGS TAKEN WITH SIMPSON 260 VOM

Fig. 1. Electrical schematic for the Vidicon Minicamera.

voltage and when the unijunction firing voltage is reached, the unijunction conducts, discharging the capacitors. This generates a sawtooth at the emitter, a positive pulse at B 1, and a negative pulse at B 2. As we will see later, these waveforms will be very useful throughout the camera.

R 14 controls the charging current to the oscillator capacitors and therefore controls the frequency.

The saw waveform from Q 8 emitter is coupled to the base of Q 9, which amplifies and inverts the signal. A portion of the signal is taken from the emitter of Q 9 and fed back to the oscillator through the linearity pot, R 16, for improved vertical linearity. R 21 controls the gain of this stage and so controls vertical size.

The collector of Q 9 is direct coupled to emitter follower Q 10, which provides low impedance drive to the vertical deflection coils through a network consisting of C 14 and R 25.

Horizontal deflection

The horizontal deflection chain starts with an oscillator similar to the vertical oscillator, with R 28, R 29, and C 15 as the frequency determining elements. R 28 controls horizontal frequency in the same way as R 14 controls vertical frequency. The positive pulse appearing at B 1 of Q 13 is direct coupled to pulse amplifier Q 14. The inverted pulse is then capacitively coupled to the horizontal deflection amplifier, Q 15.

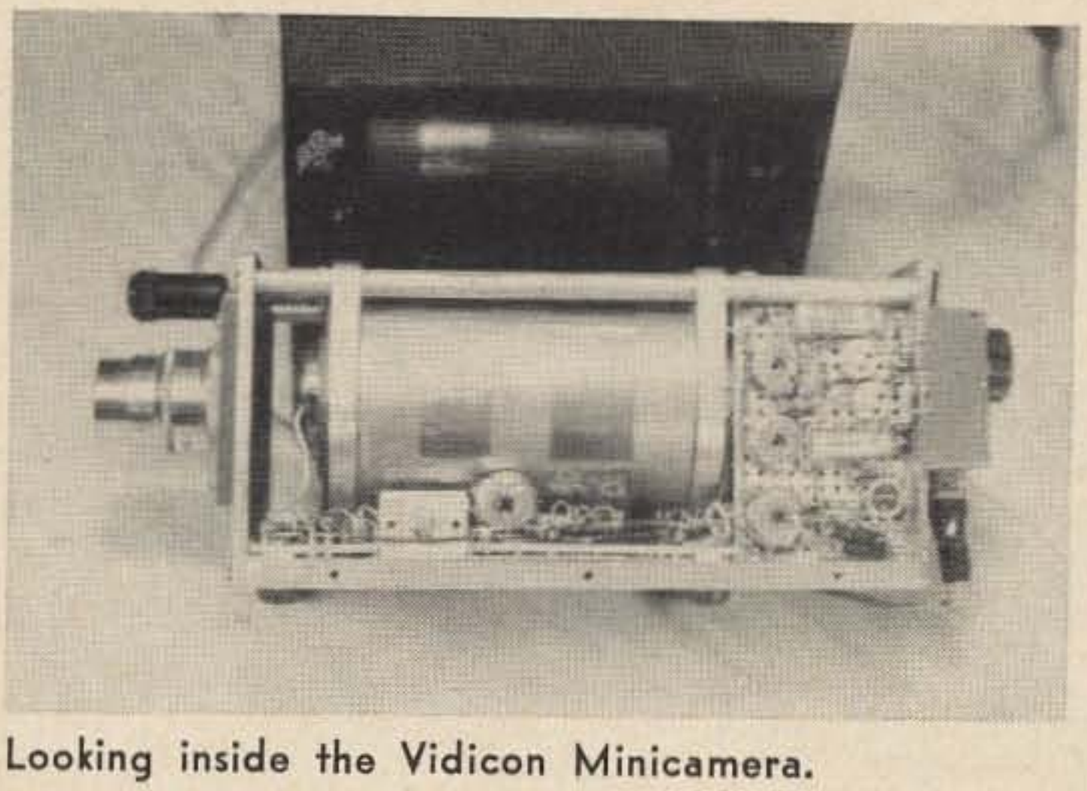
Due to the predominance of inductive reactance in the horizontal deflection coils at the line rate, the waveform supplied to the yoke must be a pulse of voltage to obtain a sawtooth of current in the yoke. This is why the horizontal deflection chain is a pulse type amplifier.

When Q 15 is turned off by the pulse from Q 14, the stored energy in L 3 is released, providing a large spike of voltage to drive the yoke. R 34 controls the size of this spike, and hence the horizontal size. C 17 tunes the output for maximum efficiency, and D 3 serves as the damper diode.

High voltage power supply

Since the vidicon requires operational voltages in the +300 and −100 volt regions, and only 12 volt input power is available, some type of dc-dc converter is required. The converter used is a simple stored-energy type which is driven from the horizontal deflection circuit. The power supply receives a pulse from the horizontal pulse amplifier, which turns Q 16 off. When Q 16 is cut off, a very large spike appears on the collector due to the release of energy which is stored in L 4.

Fig. 2. Deflection coil data.



Looking inside the Vidicon Minicamera.

The pulse at the collector of Q 16 is rectified by D 8 and filtered by C 24 to provide the −100 V for vidicon beam control. This same pulse is multiplied by the ratios on L 4, and is then rectified by D 7 to provide +300 for anode and mesh power within the vidicon.

Diodes D 5 and D 6 are 150 V zeners which regulate the output of the power supply to 300 volts.

Vidicon circuits

The only external controls on the camera are the beam, focus, and target controls. These 3 controls adjust the operating parameters of the vidicon. The beam control sets the grid bias on the electron gun in the vidicon. Optimum setting of this control will allow just enough beam current to land on the photosensitive surface to replace the highlight current lost to the load resistor and target supply. Keep in mind that the beam control has an effect on vidicon life, and should always be kept at the minimum beam (maximum negative voltage on G 1) position when any abnormal condition could occur in the vidicon parameters. This would include camera turn-on, turn-off and especially during any kind of sweep failure, as the photosensitive surface is easily damaged. During normal operation, the beam should be turned up just enough to discharge the highlight whites in the picture.

While the major part of the beam focussing is accomplished by the electromagnetic focus coil around the vidicon, a small vernier focus is available electrostatically by varying the voltage supplied to the vidicon focus anode. This voltage is supplied through R 39, the focus pot on the camera, which is adjusted for maximum picture detail.

The vidicon target requires a voltage of from +5 to +65 volts depending on tube characteristics, light level, and ambient temperature. This voltage is supplied through isolating resistor R 43 from R 41, the target control on the rear of the camera.

Since the vidicon is a storage type tube, the beam must be prevented from landing on the photosensitive surface during retrace time. This is accomplished by the blankers Q 11 and Q 12.

When vertical blanker Q 11 receives the negative pulse from the vertical oscillator during retrace, this stage conducts, pulling the cathode of V 1 up to the +10 V buss, thereby cutting V 1 off.

The horizontal blanker, Q 12, works in the same manner. It should be noted that either Q 11 or Q 12 can control beam cut off.

Diodes D 1 and D 2 prevent blanker conduction due to the small drop across R 17 and R 30 during scanning time.

Low voltage regulator

Since the camera is designed to operate from storage type batteries whose potentials may vary widely during charge and discharge cycles, and camera stability is considered important, a regulator circuit is included to hold the +10 buss reasonably constant over input fluctuations from approximately 10.8 to 14 volts.

Q 18 is connected as a difference amplifier which compares a portion of the 10 volt regulator output to a fixed reference, supplied by D 4. This amplifier controls Q 17, which is operated as an emitter fol-

The complete camera system. The black box is the battery pack using NICAD cells. The two rectangular pieces are coil forms for winding the deflection coils.

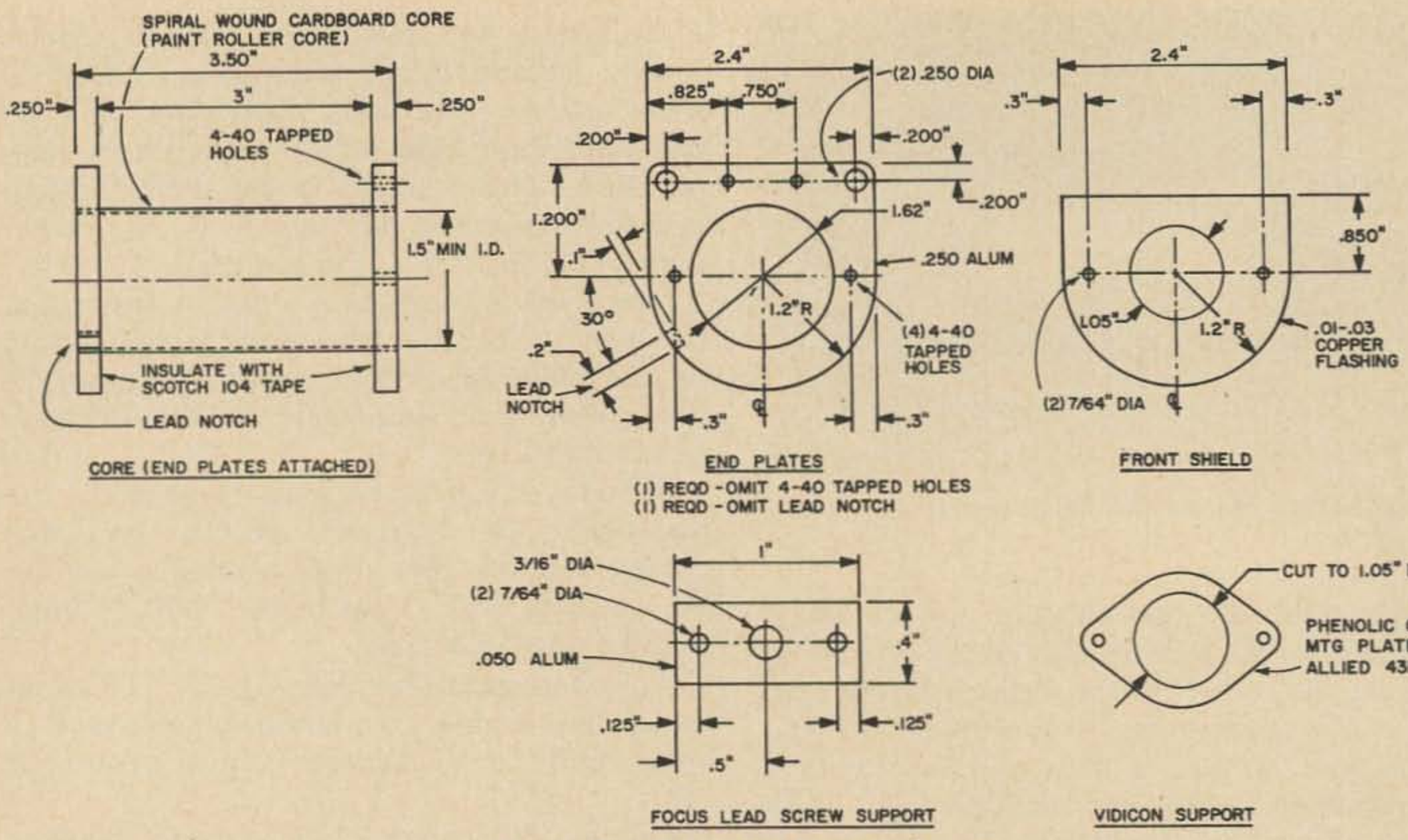


Fig. 3. Detail for the focus coil core.

lower pass transistor, R 35 controls the percentage of feedback and therefore, the potential on the + 10 V buss.

Power for the camera

In as much as the camera is designed for extreme portability, storage batteries are a natural choice for power.

Two types of cells have been found satisfactory, rechargeable alkaline, and nickle-cadmium, 3 Eveready #563 connected in series will do nicely, at moderate cost. 10 surplus nicad cells have been used very successfully.

Deflection and focus assembly construction

The deflection and focus assembly is designed to operate with low power input, and allow complete compatibility with the camera design philosophy, both mechanically and electrically.

Construction details for the deflection assembly are outlined in **Fig. 2**. The focus coil consists of 2600 turns of #25 Formvar wound on the focus coil core shown in **Fig. 3.** After the focus coil is wound, insulate with Scotch # 104 tape, and cover with a double thickness of conetic foil.

Camera construction

The electronic circuitry for the camera is divided into 5 basic sections, which are built up on the No. 85G24EP Vectorboard. Since the component density is high within the camera, neat a nd precise layout is essential.

Smaller and cheaper equivalent semiconductors have become available since this camera was built, and some consideration might be given to these, but keep in mind that the camera has been well proven in its present form.

The cases of most transistors used are connected to the collector, so be sure no shorts exist between cases and nearby components.

As the boards are completed, they should be tested in the manner outlined in the test procedure.

After the boards are tested, camera assembly can be started. The use of the .250 inch baseplate results in a very solid unit. The .250 diameter rods at the top serve two purposes, providing extra rigidity, and also providing a stable track for the moveable vidicon assembly to slide upon.

The board containing video, blanking, and sync circuitry is mounted on the baseplate below the focus coil area.

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First, an insulating sheet is cut from a file card to fit between the video board and the baseplate. The video board is then mounted to the baseplate, using spacers drilled and cut from Vectorboard, and 4-40 screws through the drilled holes in the video board corners. It will be necessary to clip all T 28 terminals at a point just below the board to clear the baseplate.

The vertical and horizontal deflection boards can now be mounted using cut-down grounding lugs soldered to the lower corner terminals, and 4-40 screws.

LV regulator and HV power supply installation can now be accomplished. These boards slide between the vertical and horizontal deflection boards in the positions indicated, and are supported by the projecting ends of the pins in these boards. Any interfering terminal ends should be clipped. All possible board interconnections should now be made.

The vidicon socket can now be wired. This is a two-piece assembly, and the rear part should be removed and discarded to provide clearance. The socket should be wired to the previously installed boards with lead lengths appropriate to allow freedom of motions from the rear cover to approximately .750 inch forward of this position. C 22 is wired directly from pin 6 to the ground end of C 29 on the video board.

All leads from the boards and vidicon socket to the control panel should now be pigtailed out and the rear endplate installed with all pigtails brought through the large hole.

All connections should now be made to the control panel, leaving enough slack for accessibility.

P 1 is made by modifying a cinch 8S M socket. This is done by soldering leads into the socket to make a mating plug. Scrap transistor leads will do nicely. First tin in the leads, force them down into the plug, and heat the plug pins from the rear to fuse the leads into the socket. Cut the leads off evenly, add a piece of # 16 wire to the center of the plug, and P 1 is complete. P 1 is now cemented to the control panel.

Now install the front endplate, vidicon, focus, and deflection assembly, and slide rods. The front endplate should be painted flat black before assembly.

Check and finish all interconnections, and install the lens mount and lens.

The lens mount shown in the picture was turned from .250 aluminum stock on a thread-cutting lathe. An easier solution to the lens mount problem is to use the unit shown on the parts lists, with the front-plate drilled and tapped to match.

The camera is now ready for the tests described in the system test procedure.

Test Procedure

Board checkout

To avoid vidicon damage, the scanning circuits must be thoroughly checked out before vidicon installation.

To make checkout less complex, each board should be tested as soon as it is completed. Assemble the LV reg. board first, so it can be used to power the other modules.

To test the LV reg. board, first parallel C 19 with a 50 ohm 5 W load resistor. Next apply + 12 V from battery to Q 17 collector through a 1 amp fast-acting fuse. Battery minus goes to the minus side of C 21.

Now, with a meter connected across C 19, R 35 should vary the voltage from less than 9 V to more than 10.75 volts. Leave final setting at +10 V. Remove load resistor.

After constructing the vertical deflection board, check with ohmmeter to be sure no shorts exist on the +12 volt line. After this test, apply +10 V power from LV reg. board, and apply scope probe to Q 8 emitter. Adjust R 14 and R 16 to obtain trace like **Fig. 4.**

Temporarily connect V yoke and set R 21 and reset R 16 and R 14 for trace (**Fig. 4**) at junction R 25 and yoke lead.

When the horizontal deflection board is completed, check for shorts, apply 10 V, and connect scope to Q 13 emitter. Adjust R 28 for **Fig. 4** trace. Temporarily connect H yoke, L 5, and set R 34 for trace similar to **Fig. 4** at yoke lead.

To check out the HV supply it will be necessary to have the horizontal deflection circuit operating. Check for shorts, temporarily connect a wire from C 27 to Q 14 collector, and fire up the horizontal deflection circuit.

Apply 10 V to the HV board and check for a pulse similar to **Fig. 4** at Q 16 base. Unless a low-capacitance probe is

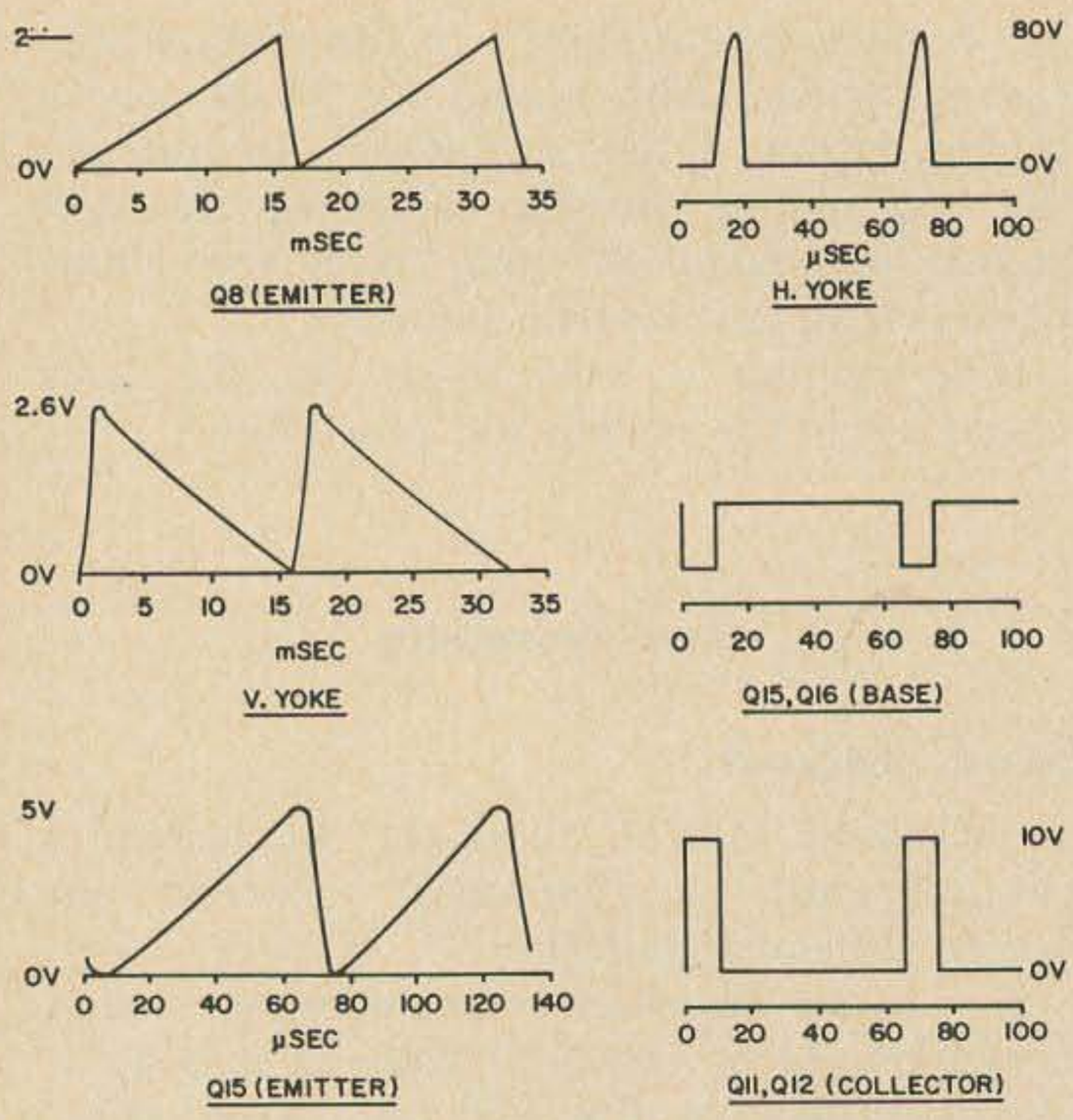

Fig. 4. Scope waveforms used in making the various adjustments in test procedure.

available, the scope will load any readings taken on the HV transformer, so it probably is best to take output at the dc terminals with a VTVM. Check for +300 ± 30 V and −100 + 40 −10 V with VTVM.

Video board tests should now be held to voltage checks, with signal readings taken during camera system checkout.

Camera system checkout and adjustment

After all board inter-connections have been thoroughly checked, test across C 19 for shorts. The resistance here should be approximately 20 ohms, using a Simpson 260 VOM with the common lead to ground. Make sure the vidicon is disconnected. Connect the 12 V source to P 1, turn power on with S 1, and adjust R 35 for + 10 V at Q 17 emitter.

Now test all points listed in the board checkout procedure for similar voltages and scope waveforms.

We are now ready to connect the video output to a monitor, either directly or through a pretested "jeep", (A unit used to convert video to one of the TV channels).

A rough check of video board operation can be made by holding a finger near the vidicon target lead. Now, vary R 6 to obtain noise on the monitor. When the above tests are satisfactorily completed, turn the power off and plug in the vidicon. Preset the beam and target controls to minimum and the focus control to midrange. Now reapply power, adjust vertical and horizontal frequency controls to sync the raster, and advance the target and beam controls until the monitor flashes with the beam control.

Set up a test pattern, open the lens iris, and it should be possible to see the first glimmerings of a picture on the monitor screen.

Set up the test pattern 18 inches from the lens, and a 60 watt bulb behind the camera. Put a dark cloth over the top of the camera to prevent stray light from falling on the vidicon faceplate.

Now adjust mechanical (optical) focus, electrical focus, beam, and target controls to obtain the best picture. The image will probably be distorted with some streaking at this time.

We are now ready to make final adjustments. Connect the scope vertical channel to the junction of R 25 and the yoke lead, and supply a 60 Hz signal to the horizontal channel.

Adjust R 14, R 16, and R 21 to obtain full vertical height and good linearity on the monitor, with a single, nearly stationary pattern showing on the scope.

Now move the vertical scope input lead to the junction of C 18 and the yoke. A stable 15.75 kHz reference for the scope horizontal can be provided by a well-insulated lead draped over the horizontal output tube of a nearby TV receiver synced to a local station.

Adjust R 28 and R 34 for a full picture on monitor, and the single, stationary pattern on the scope.

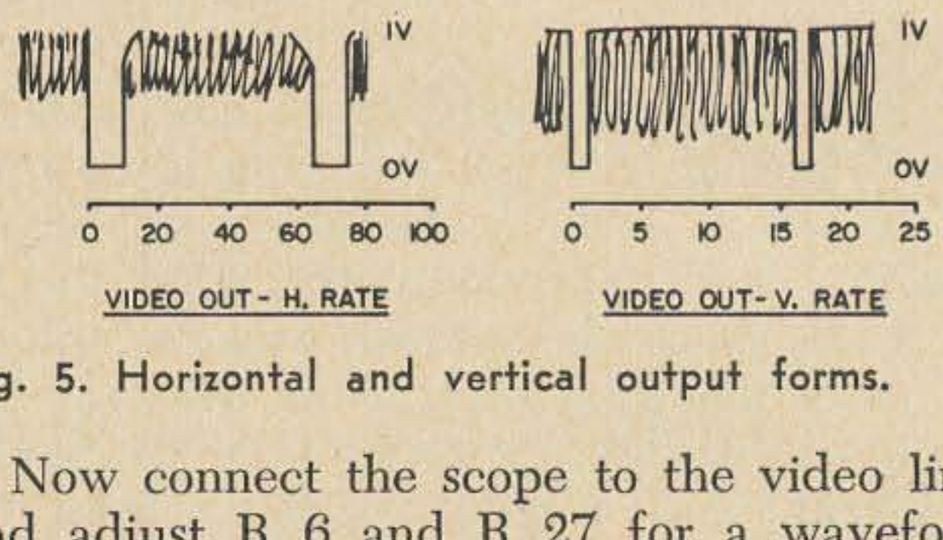

Fig. 5. Horizontal and vertical output forms.

Now connect the scope to the video line, and adjust R 6 and R 27 for a waveform as shown in **Fig. 5.** Rotate the deflection yoke inside the focus coil to obtain the proper image orientation. Reverse the yoke leads to correct for image reversal. Set C 3 for minimum streaking following the heavy horizontal bars on the test pattern. Readjust R 6 for **Fig. 5.**

This completes camera checkout.

The Vidicon Minicamera in action. The monitor is a modified Philco N1052BK solid state receiver.

Parts List

Resistors

All resistors ¼ W 10% unless noted

R 1	1 M
R 2, R 8, R 12	820 ohm
R 3	1.8 K
R 4, R 32, R 47	1 K
R 5	3.9 K
R 6, R 27, R 34	1 K Pot Mallory MCT—4
R 7, R 11, R 45	100 K
R 9	82
R 10, R 36	2.7 K
R 13, R 22, R 23	470
R 14, R 28	10 K Pot Mallory MCT—4
R 15, R 38	10 K
R 16	5 K Pot Mallory MCT—4
R 17, R 30	270
R 18, R 31	220
R 19	56 K
R 20	33 K
R 21, R 35	2 K Pot Mallory MCT—4
R 24	390
R 25	33
R 26	8.2 K
R 29	6.8 K
R 33, R 46	2.2 K
R 37	100 ohm
R 39, R 41, R 44	2 M Pot CRL BK-122
R 40	2 M
R 42, R 43	10 M

Capacitors

All capacitors in microfarad unless noted

C 1, C 23	.001-200 V	Sprague Type 192P
C 2	.0027-200 V	Sprague Type 192P
C 3	170-780 PF	Elmenco 469
C 4	20 PF Disc. Cer.	
C 5, C 18, C 29	10-12 V	Sprague TL1128
C 6	300-3 V	Sprague TE1066
C 7, C 8	10-10 V	Sprague TE1114
C 9	200-12 V	Sprague TE1137
C 10, C 14	100-10 V	Sprague TE1119.3
C 11	5.6-6 V	Kemet K5R6C6K
C 12	3.9-10 V	Kemet K3R9C10K
C 13	.68-35 V	Kemet KR68C35K
C 15	.0068-200 V	Sprague Type 192P
C 16, C 27	4-25 V	Sprague TE1201.2
C 17	.0033-200 V	Sprague Type 192P
C 19	200-10 V	Sprague TE1119.6
C 20	3-12 V	Sprague TL1122
C 21	50-10 V	Sprague TE1119
C 22, C 25	.047-400 V	Good all type 663vw
C 24	.1-200 V	Sprague Type 192P
C 26	.05-200 V	Sprague Type 192P
C 28	20-12 V	Sprague TE1130

Coils

L 1	15 Microhenry	RF choke, Miller	9310-40
L 2	560 Microhenry	RF choke, Miller	9350-26
L 3	10 Millihenry	RF choke, National	R-40-10
L 4	HV XFMR	1200 T #34 on ¼" form. tap at 400 T.	iron-slug
L 5	H yoke		
L 6	V yoke		
L 7	Focus coil		

Transistors

Q 1	2N4304	Amelco
Q 2, Q 3, Q 4, Q 5, Q 6, Q 7, Q 14, Q 18	2N706	RCA
Q 8, Q 13	2N1671	G-E
Q 9, Q 10, Q 15, Q 16, Q 17	2N1613	RCA
Q 11, Q 12	2N404 or 2N3638A	RCA-Fairchild

Diodes

D 1, D 2	1N645	G-E
D 3	1N91	G-E
D 4	1N709A	TI
D 5, D 6	1N989B	Motorola
D 7, D 8	1N 4005	TI

Switch

S1	Alco MST 115D

Indicator

DS1	Sylvania 10ASB

Connectors

P1	Subminiature socket	Switchcraft 3501FP
J1	Phono Jack	(Modified) Cinch 8SM (2 Rqd.)
Vidicon Socket		Cinch 8 VT

Miscellaneous Hardware

Approximately 30 440x¼ bright nickle mach. screws
One 85G24EP Vectorboard
100 No. T 28 Vector terminal
One chassis bottom plate Bud BPA-1596
Four rubber foot—G-C # HO52-F
.250 Aluminum
.090 Aluminum
Two 6"x.250 steel rods (available at hardware supply)
One 1.25x10-32 pan head screw (focus lead screw)
One light spring to fit 10-32 screw
Cardboard tube 1.62 OD See fig. 4
Cardboard tube 1.05 ID See fig. 10
1¾ lb. # 25 formvar magnet wire
½ lb. # 30 formvar magnet wire
½ lb. # 34 formvar magnet wire
One sheet 16x3x.004" conetic foil, conetic AA, made by Magnetic Shield Div., Perfection Mica Co.
Lens, Cinepar 25.4MM (1 in.) FL F/2.5 Edmund Scientific, # 40, 724
Lens mount, #SCM, available from ATV Research, PO Box 396, So. Sioux City, Neb.
Test Pattern 6.75"x9"

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The Little Gem Fuse Tester

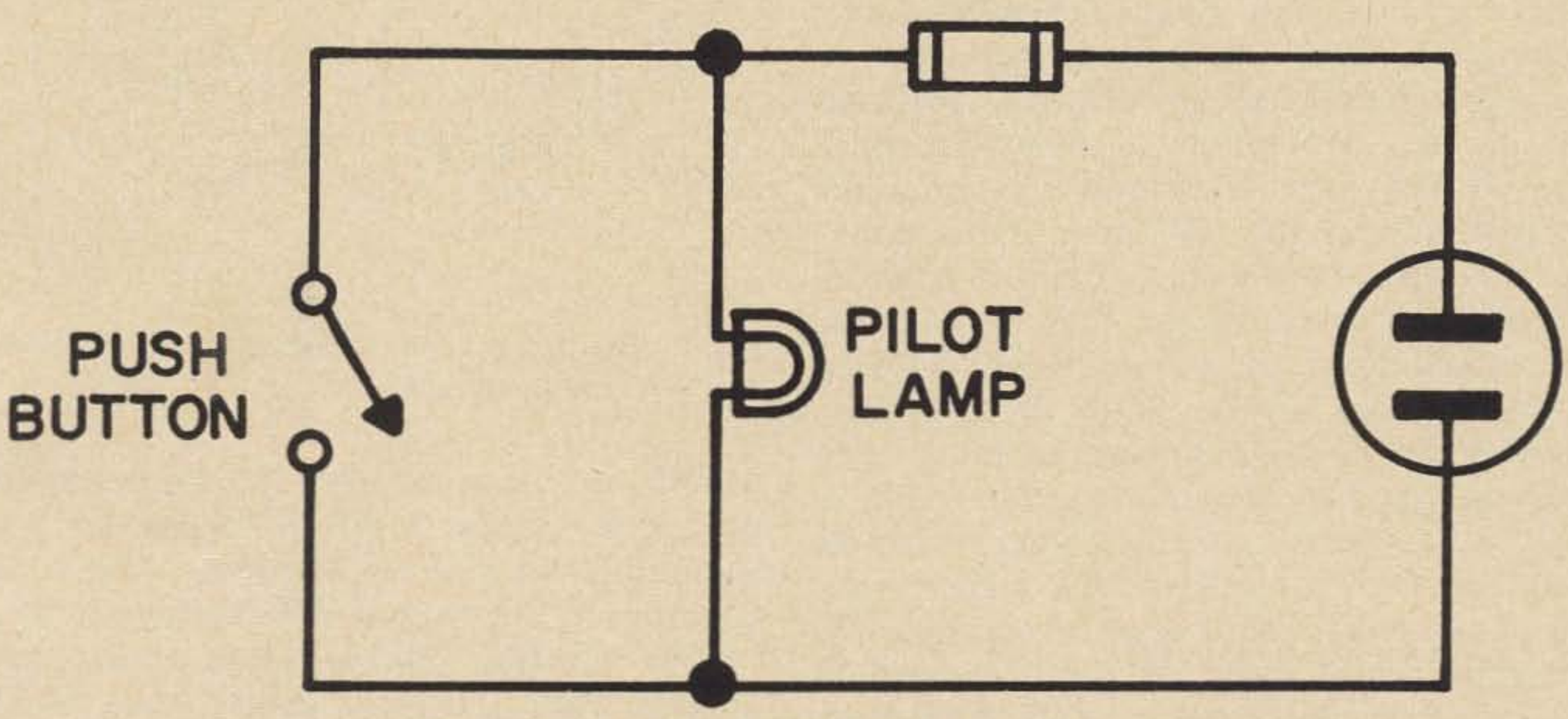


Fig. 1. Diagram for the Little Gem Fuse Tester.

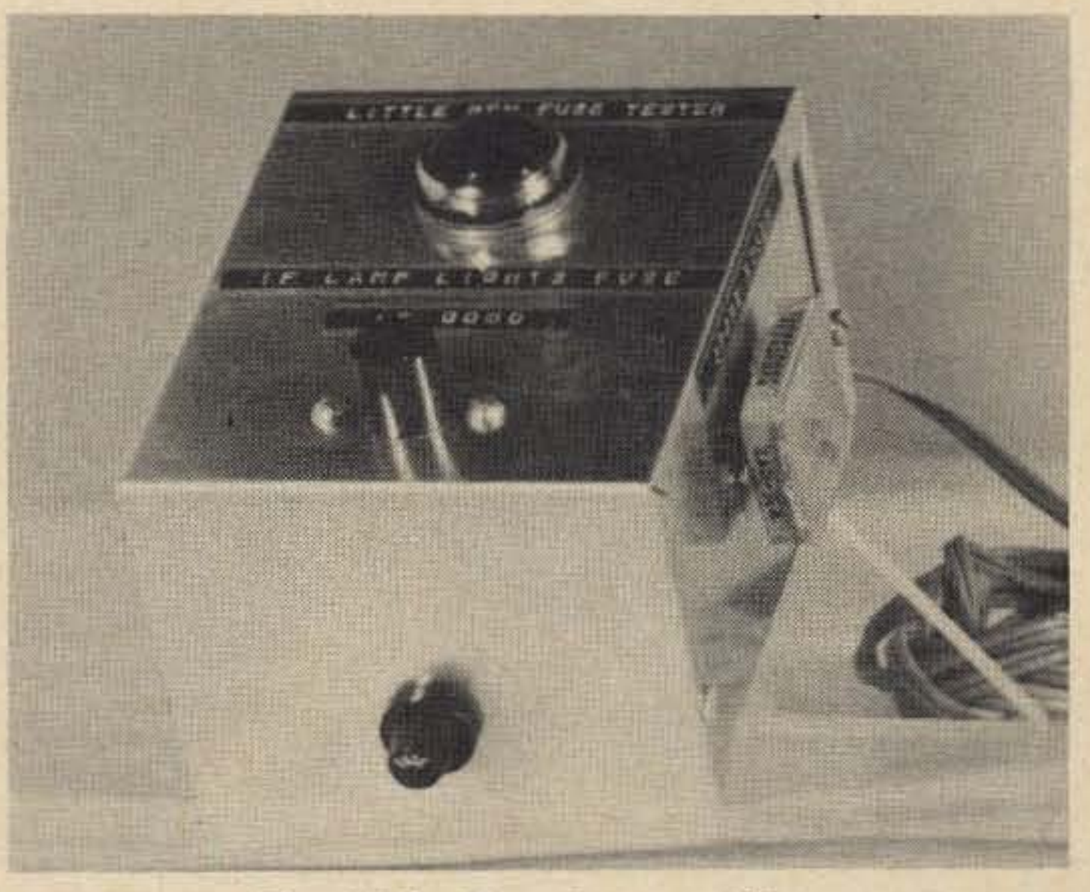
Here's an oldie that we haven't seen around for ten or fifteen years. There are several versions of this little first-day-of-April gadget. Ours calls for a neat little Minibox, a nice big bull's eye pilot light (110 Volt variety), a fuse in it's holder, a push button, a spare fuse container with spare fuses, and a cord with a plug.

On ours, we put the title "Little Gem Fuse Tester" on a plastic label at the top. In the center, we put "If lamp lights, fuse is good". There is no label on the push button. Everyone has an uncontrollable urge to push a button. If you push the button, of course, the fuse is blown and the light goes out.

There are several approaches to the use of this "Little Gem". One way is to simply lay it on an associates desk or work table. He will probably come in, pick it up, plug it in, and try it out. As soon as he realizes that he has been had, he will put it on the next person's desk. The spare fuse container may have to be refilled a time or two during the day. One variation is to leave out the fuse, in which case the building fuse blows and possibly the lights go out. Some administrative personnel may take a dim view of this!

In our case, we made out a very official interdepartmental memo stating that we needed some lay experimenters to determine the value of the device. Then on a second sheet (not to be read prior to experimenting) we put a bunch of questions like, "Was the fuse good?", "Is it still good?", etc. All leading up to a "Happy first day of April to you".

. . . W7CSD



The Little Gem in operation.

John J. Schultz W1DCG
40 Rossie St.
Mystic, Connecticut 06355

Methods of Transceiver CW Switching

Most transceivers which operate on CW, still have an awkward means of send/receive switching on CW, while SSB operation is made convenient by means of push-to-talk or VOX circuits. A number of ideas are presented on how to make transceiver operation more pleasant for the CW man. Most transceiver manufacturers seem to make a point of neglecting the needs of the CW operator in their designs. Even those models which cover the CW portions of the bands, lack sharper selectivity for CW, a keying monitor, and a convenient means of send/receive switching in the CW mode. Most transceivers which do operate on CW, require that a rather awkward panel switch be thrown every time for send/receive switching. At least for phone operation, a push-to-talk or VOX switching circuit is provided, but the CW operator is still left with the old-fashioned, panel type send/receive switch.

Besides the plain inconvenience involved in handling the switch for each transmission changeover, the panel around the switch usually begins looking worn very quickly, since the switch becomes the most frequently handled control.

The value of extremely fast break-in operation for the average CW operator, who does not engage in traffic handling, is probably debatable. Therefore, the simple circuits described in this article may not satisfy the avid traffic man, but should meet the needs of other CW operators.

The send/receive or SSB/CW switch, (as it is usually labelled on most transceivers),

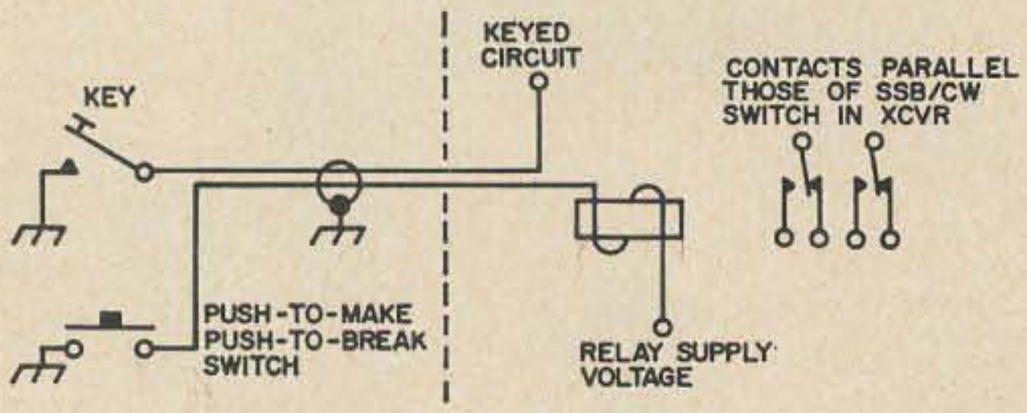


Fig. 1. Simple placement of push switch at the key to control transciever.

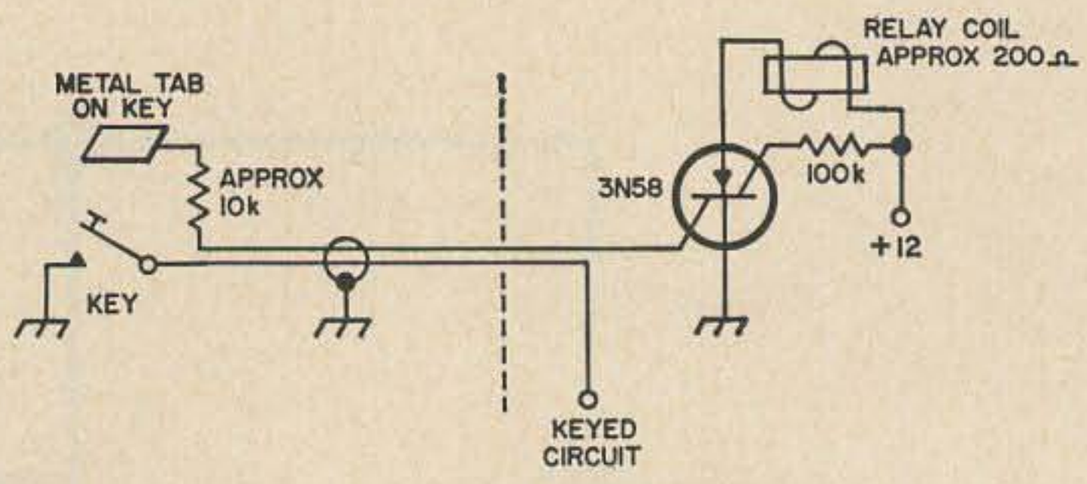


Fig. 2. Use of a hand capacity circuit to activate the CW switching relay.

usually performs several functions:switching of circuit relays (such as those for meter switching and antenna transfer), carrier oscillator offset, opening of the keying circuit and carrier insertion. The latter function may be accomplished, on some transceivers, by simply turning the carrier balance control to one side.

These switching functions are usually controlled by the equivalent of a DPDT to 4PDT switch configuration. This can easily be determined from the transceiver schematic. The simplest method for providing easier send/receive switching on CW, is to use one or two miniature DPDT relays, installed inside the transceiver, and wired to parallel the contacts of the SSB/CW switch.

Remote control of the relays can be provided by replacing the usual 2 circuit key jack with a 3 circuit key jack, using a 2 wire shielded cable to the key, and installing a sub-miniature toggle (or push-to-make push-to-break) switch on the key base. Sub-miniature switches, such as the Alcoswitch types MST-115D and MSP-205N, are particularly suitable and are readily available. A foot switch from a tape recorder can also be used for control.

For those who want to eliminate a remote control switch entirely, several methods of control can be used. One method involves the use of a hand capacity circuit, utilizing a silicon controlled switch as shown in **Fig. 2.** Hand capacity on the contact tab will cause the SCS to conduct and energize the relay coil. The contact tab can be a small

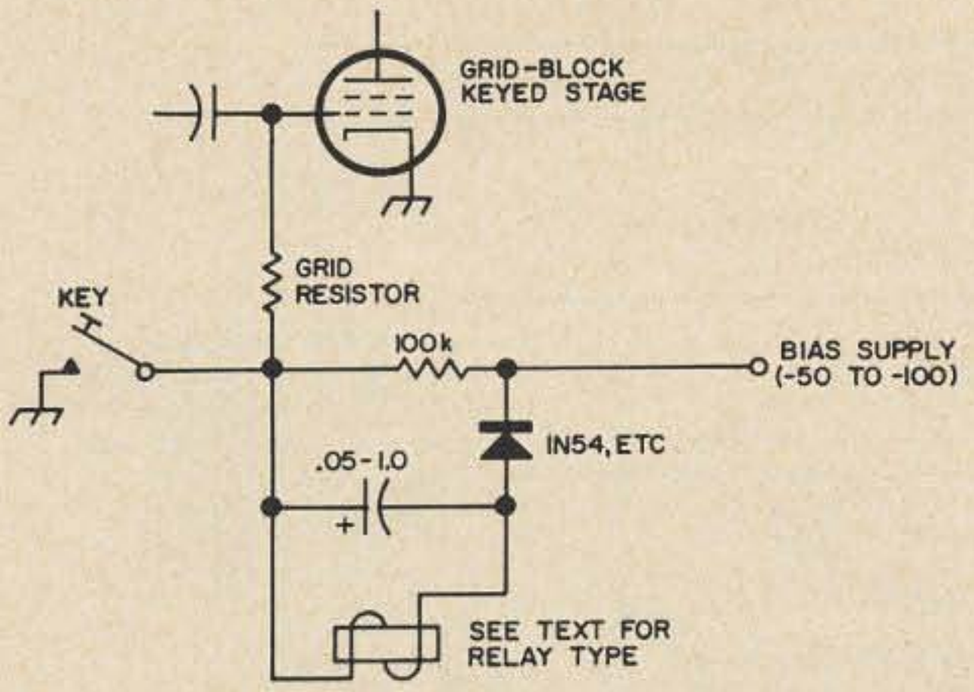


Fig. 3. Placing a high resistance relay directly in the keyed bias line may provide a very simple switching means with a time delay determined by the size of the capacitor across the relay coil.

piece of metal placed on top or the side of the key paddle. Both resistors can be varied in value to control the sensitivity of the circuit and will probably need initial adjustment depending upon the capacity to ground of the control lead in the keying cable from the transmitter, and the characteristics of the particular relay used.

More stable operation may also be obtained if a grounded metal surface is placed so that it makes contact with the edge of the hand which manipulates the keying paddle. With this circuit, placing a hand on the key or removing it from the key will automatically control the relay action.

Another method for relay control which requires no external control wiring is shown in **Fig. 3.** A miniature high resistance relay, such as a Phillips MK/2C/5000D or similar type, is necessary. The contacts of the relay are wired to parallel those of the SSB/CW switch in the transceiver. The coil of the relays(s) is wired across the current limiting resistor in the bias line to the keyed stage in a grid-block keying system. Closing of the key will energize the relay(s) as well as turn on the keyed stage. The capacitor across the relay coil(s) will charge quite rapidly because of the low resistance of the bias voltage source, and the high resistance of the relay coil(s). When the key is opened the charge across the capacitor will keep the relay(s) energized for a period which is determined by the capacitor size and the relay coil characteristics.

By experimenting with the capacitor size, a delay, from a fraction of a second to several seconds or longer, can be obtained to suit any keying speed. If a variable delay is desired, a 500 K ohm potentiometer can be placed in parallel with the capacitor.

The diode in the circuit prevents discharge of the capacitor through the current limiting resistance, and also distortion in the keying waveshape on the break portion of the keying sequence due to delay in having the bias voltage cut-off the keyed stage.

Still another method of switching which works basically the same as the preceeding method as far as relay action is concerned, but provides several additional functions and advantages is shown in **Fig. 4.** Transistor Q_1 is used as a switch to close the keying circuit in the transmitter, instead of the key contacts directly. The voltage across the key contacts is considerably reduced and sparking is essentially eliminated. The keying waveshape characteristics can be controlled by changing the resistor/capacitor combination in the base of Q_1. Transistor Q_2 acts as a simple switch to energize the coils of the relay which performs the SSB/CW switching functions.

As with the circuit of **Fig. 3,** the size of the capacitor across the relay coil determines the time delay range. Transistor Q_3 acts as another switch to energize the simple CW monitor circuit of Q_4.

The entire circuit, except for the relays, can be built into the transceiver, if space is available, or, otherwise, in a separate Minibox. A battery supply can be used for the necessary voltages, with a miniature speaker

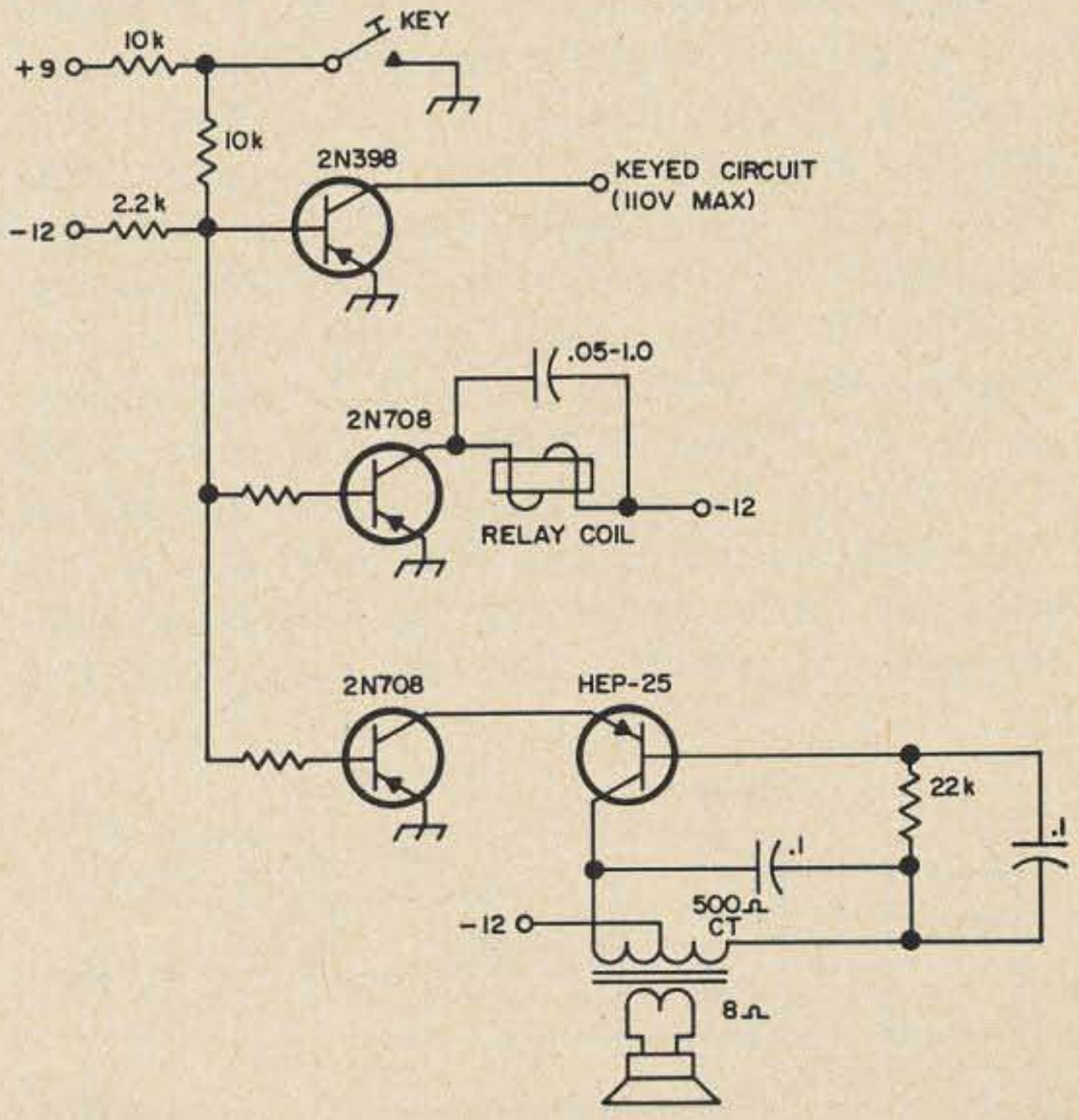


Fig. 4. Manual key controls three transistor switches which energize keying circuit, relay switching and CW Monitor.

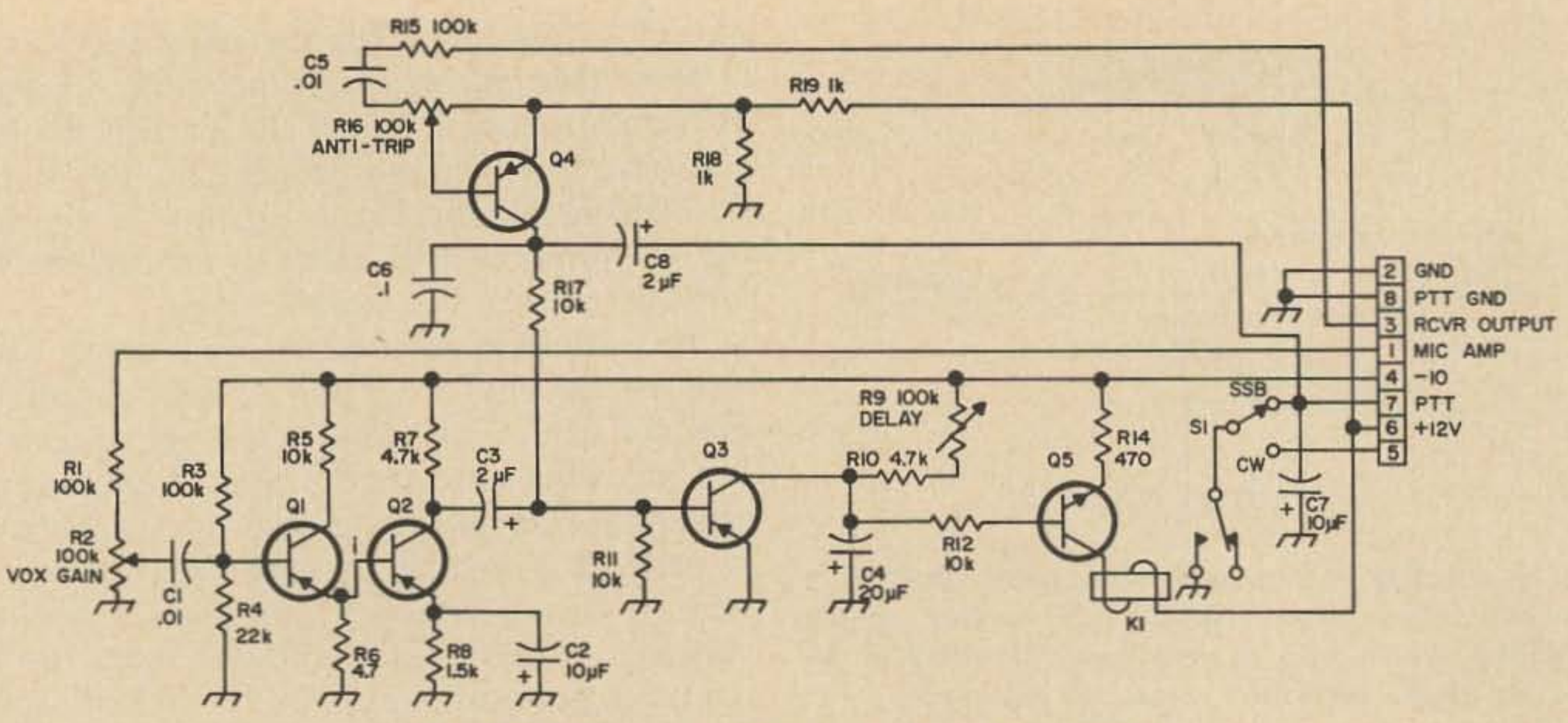


Fig. 5 Addition of switch to the Swan VX-1 VOX.

for the CW monitor; thus reducing the external wiring required.

Perhaps the simplest switching circuit of all can be devised by using the VOX circuitry of a transceiver which has such a feature. For instance, **Fig. 5** shows the schematic of the Swan VX-1 VOX unit, which is generally similar to a number of tube or transistor accessory VOX units.

For CW operation, the features of the same VOX unit can be utilized by installing a switch (S, in **Fig. 5**) so the VOX relay either controls the PTT circuit on SSB, or the coil of a relay which parallels the SSB/CW switch contacts inside the transceiver.

Since the first audio stage in the Swan 350 remains energized on CW (the second stage is de-energized), an audio tone, fed into the microphone input, will operate the VOX unit. This audio tone can simultaneously be used for CW monitoring as shown in **Fig. 6.** Thus, with a relatively simple modification, one can have all the advantages of the VOX unit on CW as well as on SSB.

It should be noted that since the keyed tone only activates the VOX unit and is not used for carrier generation, as with some keying systems which utilize an audio tone fed into a SSB transmitter audio input, its waveshape is unimportant.

Many of the above suggested switching systems were tried with a Swan 350 transceiver. However, if the reader first carefully examines the schematic for another transceiver to determine exactly how the SSB/CW switching functions are accomplished, there should be no difficulty in adapting any transceiver for much more convenient send/receive switching on CW.

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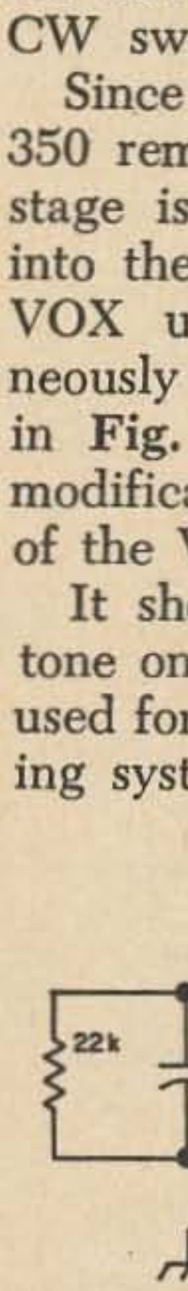

Fig. 6. Simple keying monitor/tone unit for use with a transceiver for CW operation.

"Never mind how she became interested in shortwave, if she's married, how old she is, and the color of her eyes—just give her our location."

Operation Santa Claus

Operation Santa Claus, one of the largest single-day charity drives in the world, was held in Des Moines on December 14, under the sponsership of the Des Moines Radio Amateur Association and the Central Iowa VHF Club. The eighteenth annual Operation Santa Claus filled a Volunteers of America warehouse with food, toys, clothing, and everything else imaginable.

From 12:30 in the afternoon, until 7:00 at night, Radio Station KRNT put out requests for anything which might brighten the Christmas of someone less fortunate. Over 1,100 calls, on five phone lines, came in to the KRNT studio in this 6½ hour period. Hams in the studio dispatched calls on three bands over equipment remotely controlled from the studio. Calls were dispatched directly to cars and also to two fixed stations. Hams not having mobiles were also pressed into service because of the large volume of calls. The non-mobiles went to the fixed stations and picked up addresses there.

Thirty mobiles, and eight cars without radios were in use throughout the afternoon and evening.

The Des Moines Club was assisted by several cars from the Newton, Iowa Club. As in past years, one of the cars was driven by ARRL President Bob Denniston, WØNWX, who was participating in his 10th consecutive Operation Santa Claus.

In all, over 1,800 miles were driven by 38 cars while handling over 1,100 calls. The eighteenth annual Operation Santa Claus was a great success because the Christmas of 700 Des Moines area families was made a little brighter. ■

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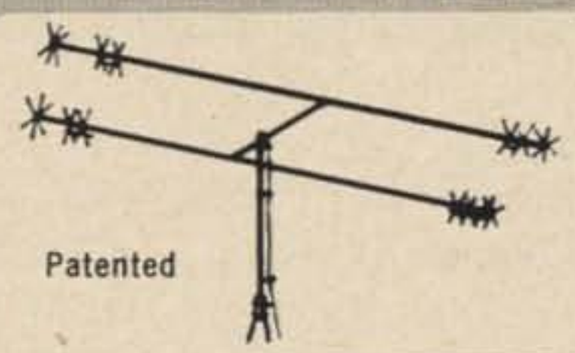

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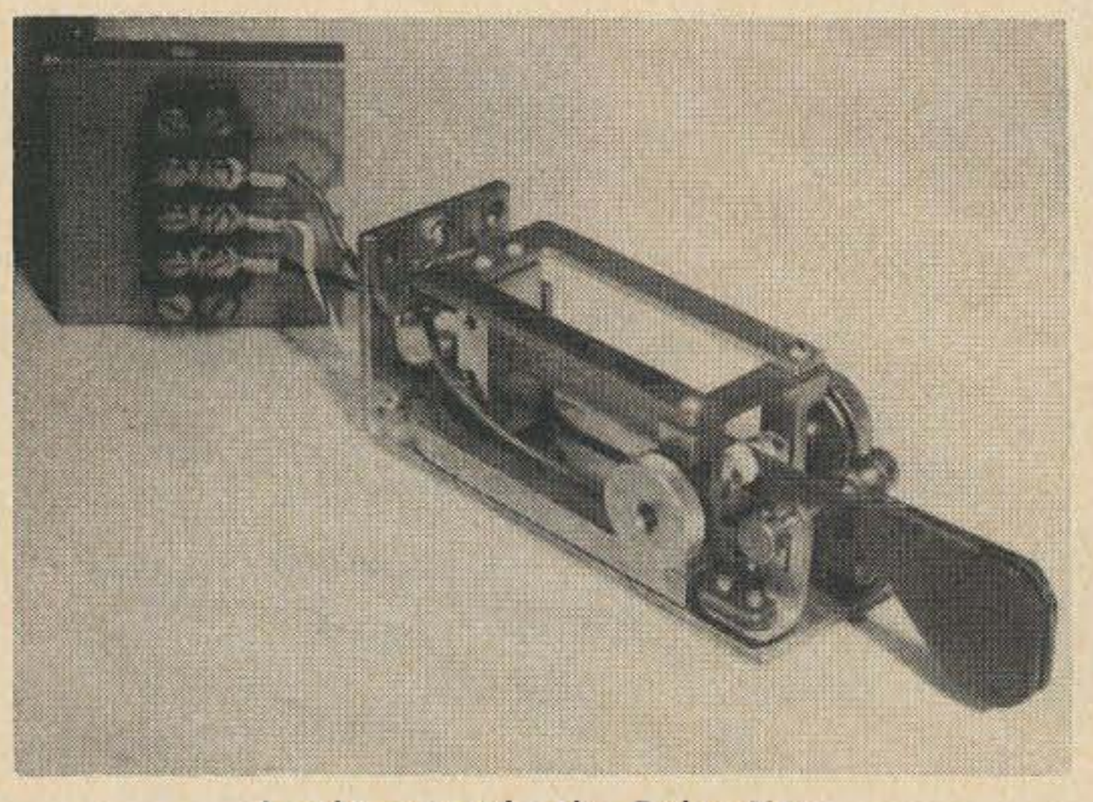
The Polar Key

73 Magazine has presented many fine articles on constructing automatic keyers, and details for devices to actuate these keyers. However, the mechanical parts seem to present a problem to the average ham and the services of an experienced, well equipped machinist are required to fabricate the metal parts of most. Those that do not require these precision parts often look a little "too homebrew", and make no provision for the adjustments that a CW operator needs to create the right "feel" in his key.

The mechanical key described in this article was devised to solve these construction problems. In addition, lever tension and contact spacing may be adjusted, as desired, for good smooth operation.

The "heart" of this key is obtained from the W. E. 255A Polar Relay. These relays are available from a number of surplus dealers for about $2.50. The relay need not be in operating condition for its' designed purpose, and a defunct relay can be used. There should be no missing parts, however, except the coil assembly and the case. Do not overlook the possibility of your junkbox, or of obtaining one from a friend on RATT. The entire project should not cost over $3.50; much less if a relay can be borrowed.



Looking inside the Polar Key.

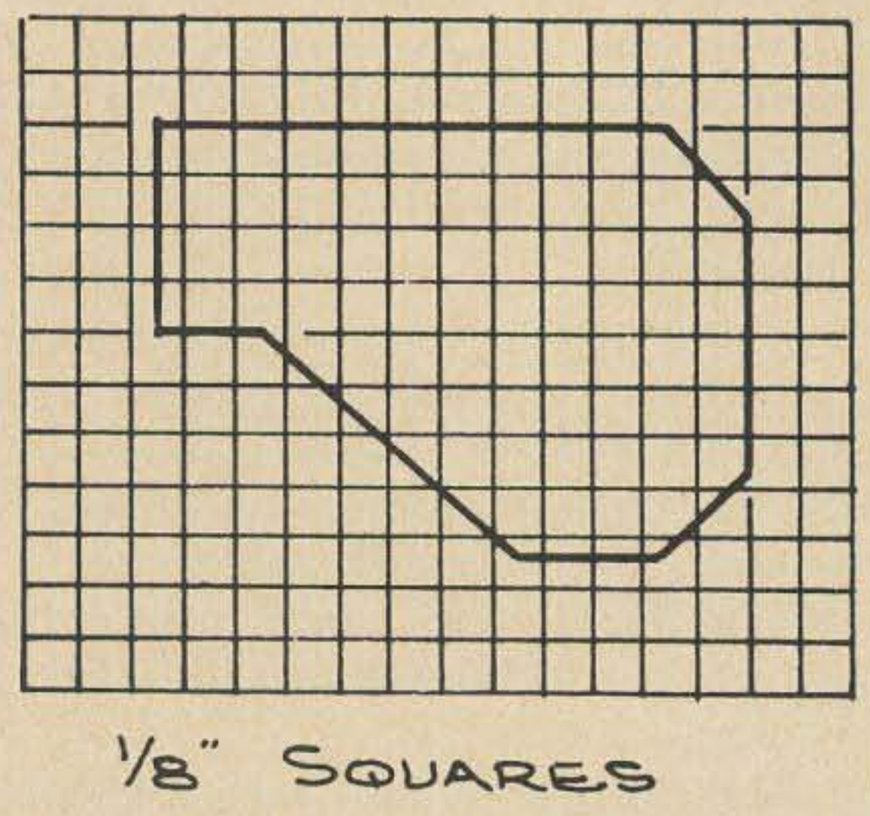


Fig. 1. Design for the Polar Key paddle.

The following additional parts will be required; a small ignition file, a 2-1/4 by 2-1/4 by 7 inch Mini-box, four rubber mounting feet, and two small circular pieces of foam rubber, such as those used for ladies' earrings.

Now, on with the construction! First, remove the relay from its' housing and base. Disconnect the coil and contact wires from the rear terminals. Remove the coil and lever armature assembly. This is done by removing the top part of the relay frame, two small screws securing the lower front part of the coil, and loosening the metal plate holding the rear end of the lever armature.

Cut the two sides of the paddle assembly, as shown, from some type of stiff insulating board. Fibre epoxy works well. Affix these two paddles on each side of the rough end of the ignition file, using epoxy. Clamp firmly until set. Shape the handle end of the file, and slip this end into the space formerly holding the lever armature. Align the lever with the front contacts and tighten the metal plate firmly.

Attach the foam rubber pads to the ends of the spacers that are attached to the large

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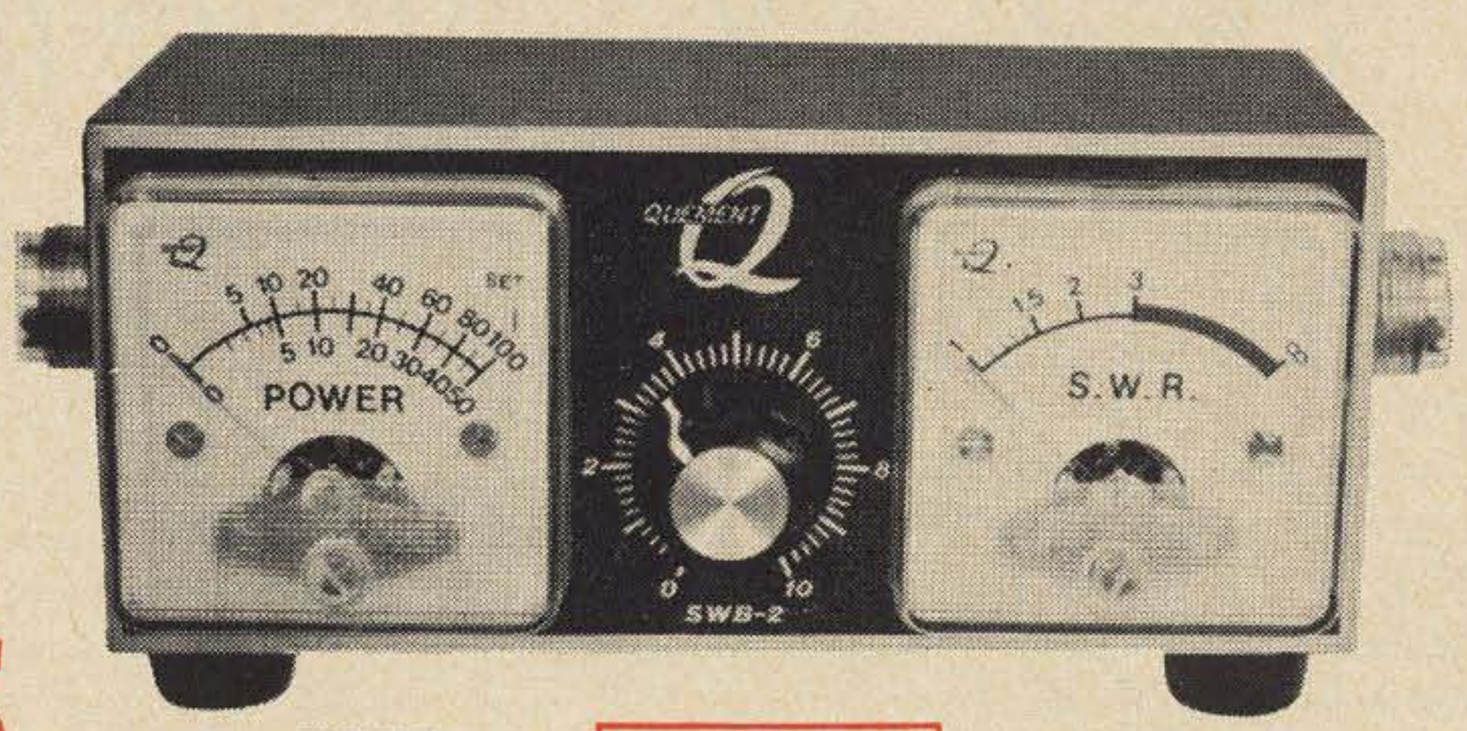

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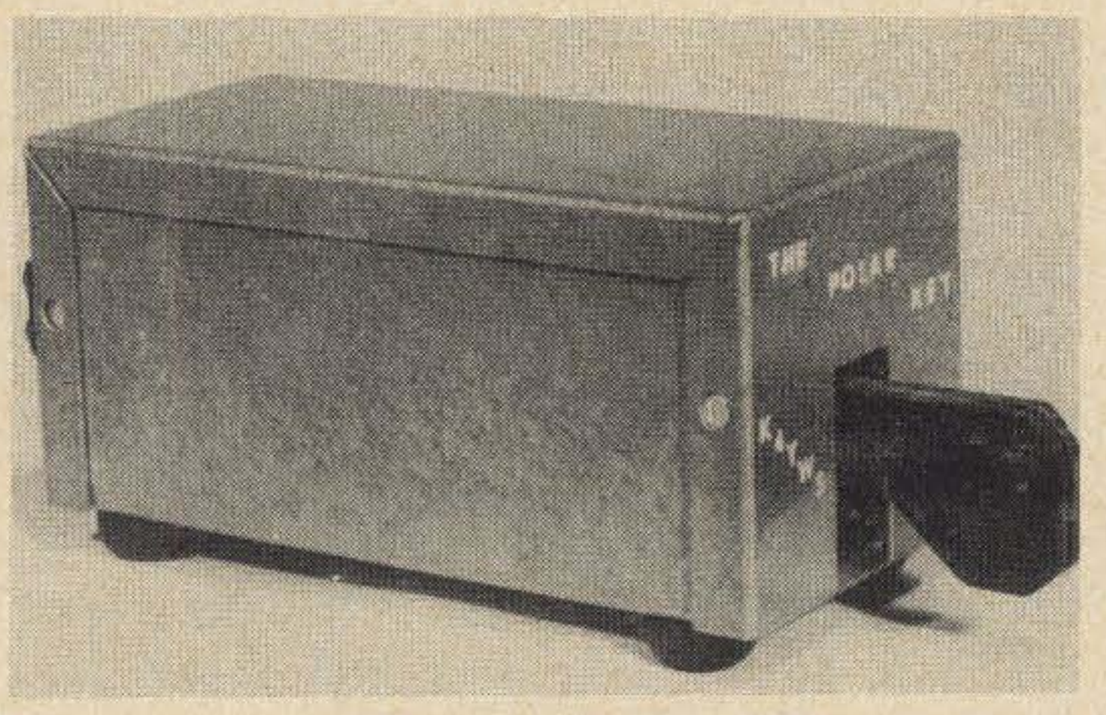

The final package.

knurled knobs. Use glue that will not dissolve the foam rubber. The ignition file, now serving as a lever, will reset between these two rubber pads, and will allow adjustment of side tension on the lever. This will also dampen any unwanted vibration of the keying lever.

Mount the completed key in the Mini-box, using the holes in the bottom of the relay frame. Make a cut-out in the front of the Mini-box cover, to allow space for the paddle and lever. Install the four rubber mounting feet. Rough the bottom of these feet, with a file, to give a better grip on top of your operating surface. Mount a three connection terminal on the rear of the Mini-box cover. Connect the three wires from the relay to this terminal. The white wire should be in the center, and will serve as common ground. The red and white wires go to either contact, for selection of "dots" and "dashes".

Now adjust the keying lever tension and contact spacing to suit your "fist" and install the top cover.

You now have a nice looking mechanical key, with precision adjustments, and all for very little expenditure in time and money.

Many thanks to my friend, Holman Johnson, K4SRF, for his excellent photography.

Hope you enjoy "The Polar Key".

. . . K4YWS

Carl S. Drumeller, W5EHC
5824 N. W. 58th Street
Warr Acres, Oklahoma 73122

Checking Your VSWR Indicator

Many articles have been published on how to build and even some on how to calibrate a VSWR indicator. The calibration instructions usually tell you to terminate the indicator's output with a purely-resistive 52-ohm load and then to adjust the device so that a maximum forward and minimum reflected meter deflections are obtained. Sometimes they'll go further and tell you to reverse the device and recheck for opposite indications.

This is all very well. It assures you that the VSWR indicator will be telling you the truth when it says "All's well!" while looking into an utterly-flat transmission line. It doesn't tell you a thing about what the indicator will have to say when it gets tangled up with a line that has a wildly-mismatched termination.

As most transmission lines, in actual practice, are terminated in loads which are not only mismatched in the matter of resistance but also in the inclusion of a considerable magnitude of reactance, it would be well to explore the indications you'll get under realistic circumstances. After all, these are the situations under which you'd want to take corrective steps. Accurate indications of undesired conditions, therefore, are imperative if intelligent remedial actions are to be taken.

Fortunately, some quite enlightening tests are made easily. All you'll need are some lengths of coax transmission line (the same as you're using in your antenna feedline) equipped with male fittings at each end and a few female-to-female junctions. Select the frequency at which you want to make the test. Usually it's wise to make the test on the highest frequency band you plan to use. With this in mind, make up three one-eighth wavelength sections of transmission line and mount the male fittings on the ends of each section.

If your antenna presents an unmatched load to your transmission line, you may elect to skip over this paragraph and go directly to the next one. If it does not (Ah, you dreamer!), you'll need another piece of transmission line. It should be fairly long, perhaps a half wavelength. Put a male fitting at one end and attach a termination, which is deliberately made to be a sad mismatch, at the other end. Don't just mismatch it by using too high or too low a value of resistance. Throw in some reactance, too! You might use a resistor with an inductor in series. Or, you might try a capacitor in series with the resistor. Or, you could use either an inductor or a capacitor in parallel with a resistor. In fact, it would be best to experiment with all four!

Now that you have a transmission line available that you know is mismatched, you're ready to start the test. The first check (the "control", you might call it) is made with everything normal. That is, you'll have the transmitter feeding directly into the VSWR indicator's transfer box and the transmission line (either the one to your antenna or the substitute line to the mismatched load) attached to the output of the transfer box. Note the VSWR indicated. Also note your transmitter; insure that it's tuned to resonance and is adjusted to a power you can maintain throughout the first portion of the tests. Jot down these indications. Now, insert an eighth-wave section between the transfer box and the transmission line and without making *any* other changes or adjustments, note the VSWR. Repeat these steps, adding an additional eighth-wave section each time until you've used all three. Did you detect any change in VSWR? If there was even the slightest change, your VSWR indicator is not trustworthy!

Now for two more checks. Try varying the transmitter power output. Does this have any effect upon the indicated VSWR? If it does, your VSWR indicator is not trustworthy! Then try varying the transmitter output tuning, deliberately throwing the stage out of resonance. Does this have any effect upon the indicated VSWR? If it does, your VSWR indicator is not trustworthy!

Few VSWR indicators under the $150 class will pass these basic tests. If yours doesn't, don't be perturbed. You have an instrument that still has a useful field of application. You can use it as a comparative indicator. For instance, if you're adjusting the gamma match at an antenna, it'll serve quite well; in this application, you're holding all of the significant variables constant, with the exception of one (the gamma match), the effect of which you want to observe. Your tests will have shown you the parameters you'll have to hold constant for any other than simple comparisons. In all probability, you will have found that measurements taken with different (electrical) lengths of transmission line are invalid. Also, it's probable that, owing to the non-congruity of diode curves, measurements will have to be taken at precisely the same level of rf power if accurate comparisons are to be made.

If you'll keep its very real limitations in mind, you'll find that even an inexpensive VSWR indicator has excellent potentials for useful measurements. But don't ask it to perform at levels that even its expensive siblings can't attain!

. . . W5EHC

Ham Of The Year Award

The Federation of Eastern Mass. Amateur Radio Associations is now accepting nominations for the 1968 John Mansfield Memorial award "Ham of the Year". Only licensed amateurs in the 1st call district are eligible for this award and the candidate must be able to meet any one or more of the following qualifications.

1. Performed a meritorius public service to his community through amateur radio. 2. Made a major contribution to the science of amateur radio. 3. Helped greatly to stimulate interest in amateur radio in others. 4. Aided other radio amateurs to acquire a greater knowledge and skill in operating or building amateur radio equipment.

The winner of this award will be presented a plaque and a cash award on June 1, 1968 at the New England ARRL convention at the New Ocean House, Swampscott, Mass.

Send all nominations to Eli Nannis W1HKG, Chairman Awards Committee, 37 Lowell St. Malden, Mass. 02148. The closing date is April 26, 1968.

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Video Mixing Amplifiers

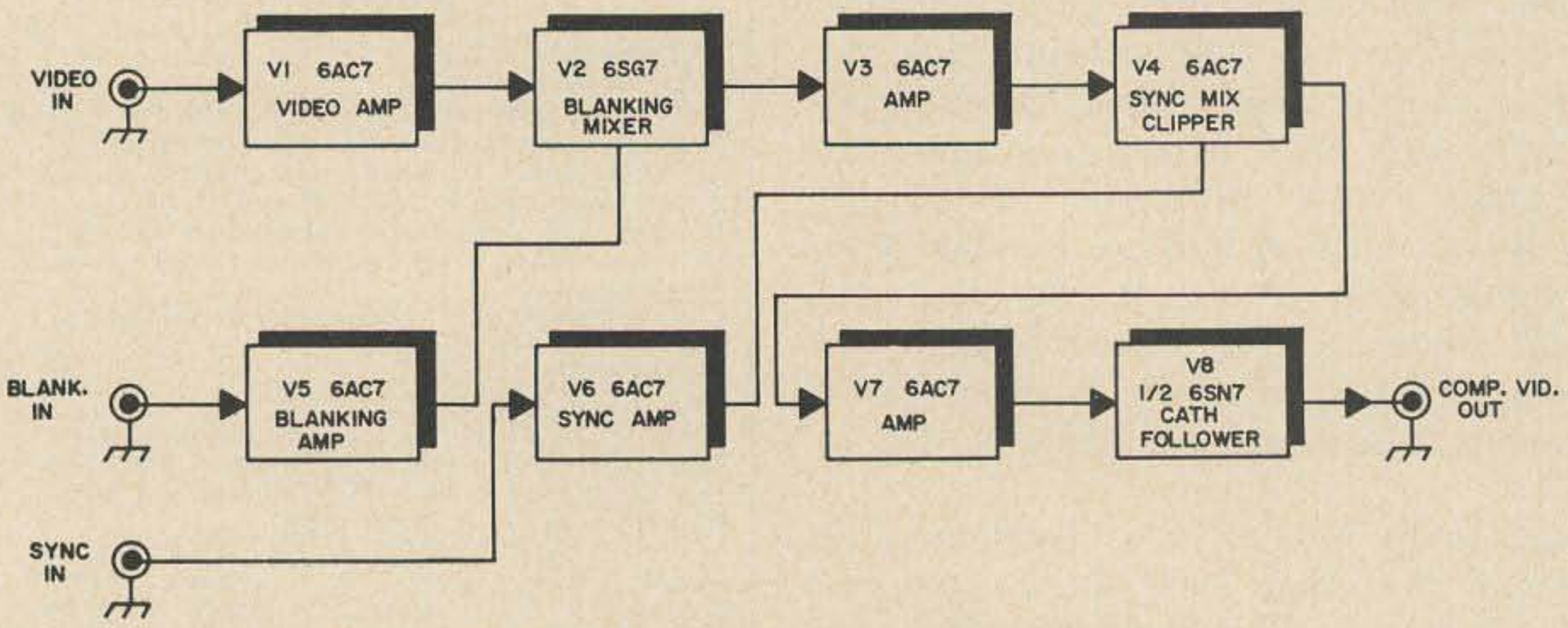

Fig. 1. Block diagram of the video mixing amplifiers.

In order to produce a good composite video signal, one must have a system for properly inserting all video information.

Hence the purpose of this article, which will describe video mixing techniques.

There are three inputs. First is the video from the camera, second the blanking from the blanking pulse generators, and third the synch pulses from the shaping generators.

Video is fed to V1 whose output connects to V2. The gain control being at the input video connector. The video input being white negative.

The composite blanking is fed into V5. These pulses are negative going. A 1N34 is used in the grid circuit for clamping purposes. The plate of V2 and V5 are parallelled. Mixing of the video and blanking is achieved in this manner. Blanking amplitude is controlled in the cathode, and the cathode bias is monitored at TP2.

At this time, it should be mentioned that **Fig. 3** shows the test points and typical voltage values which can be expected. There will be a slight variation due to the aging of the tubes.

V2 is a Gamma control amplifier. For our particular case the voltage at TP1 was 0 volts. Our camera incorporates a vidicon tube, and no gamma problems were evident. Grid of V2 is also clamped.

Negative composite synch pulses are fed to V6. Synch level is set and monitored at TP4. The plate of V6 is parallelled with the plate of V4.

V7 is an amplifier and also an inverter stage so that the polarity of the composite video is correct. The 10 k pot in the cathode circuit acts as a gain control. The purpose is to prevent overdriving the cathode follower (V8) which is also the output stage.

Once the amplifiers are set up, it would be advisable to observe wave forms at each stage. These are shown in **Fig. 4**. It may

TYPICAL VOLTAGES

T P 1.	O.O V.D.C.
T P 2.	4.2 V.D.C.
T P 3.	5.5 V.D.C.
T P 4.	2.9 V.D.C.

FIG. 3. Test point voltages

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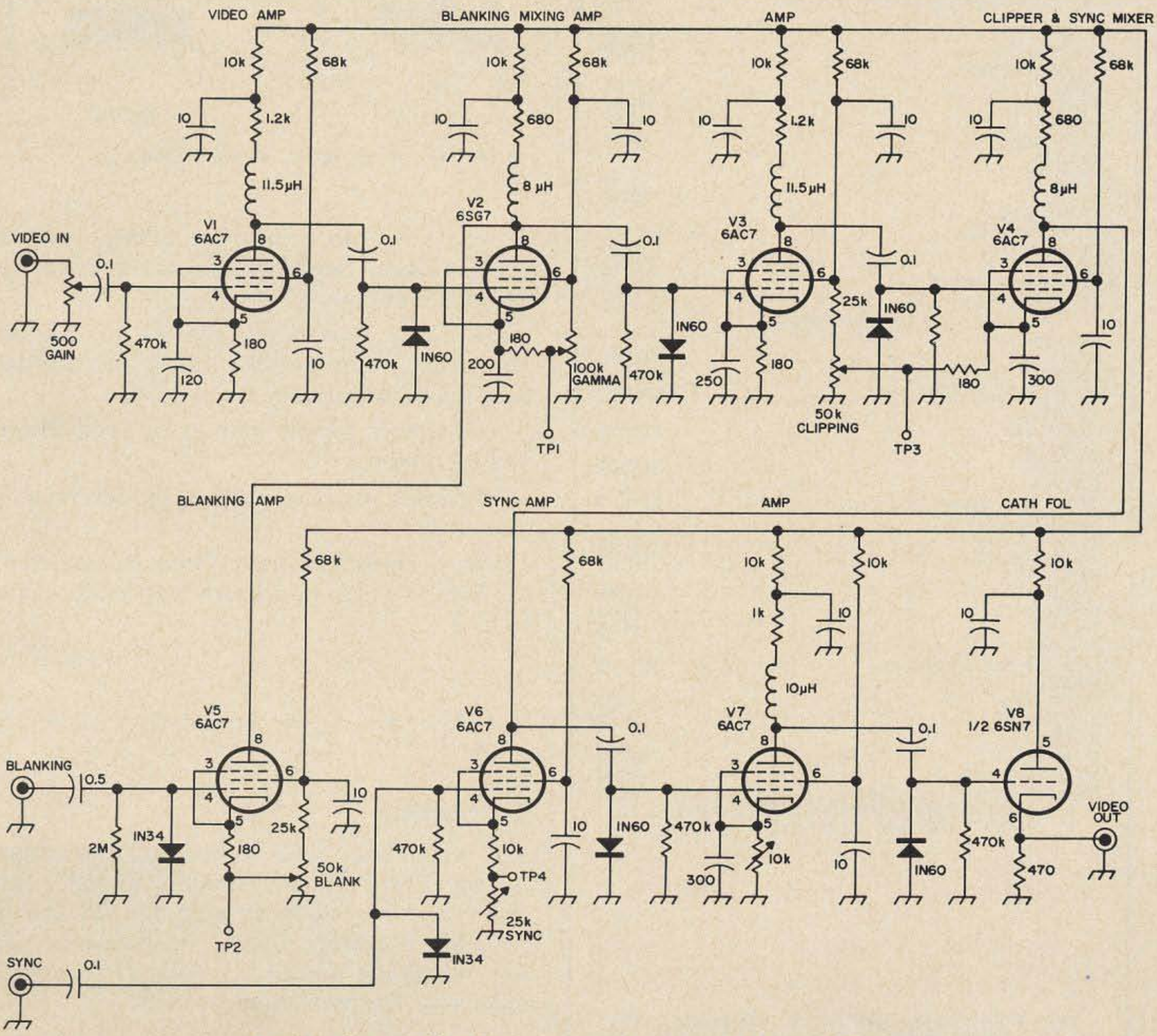

Fig. 2. The actual schematic wiring diagram of the amplifiers.

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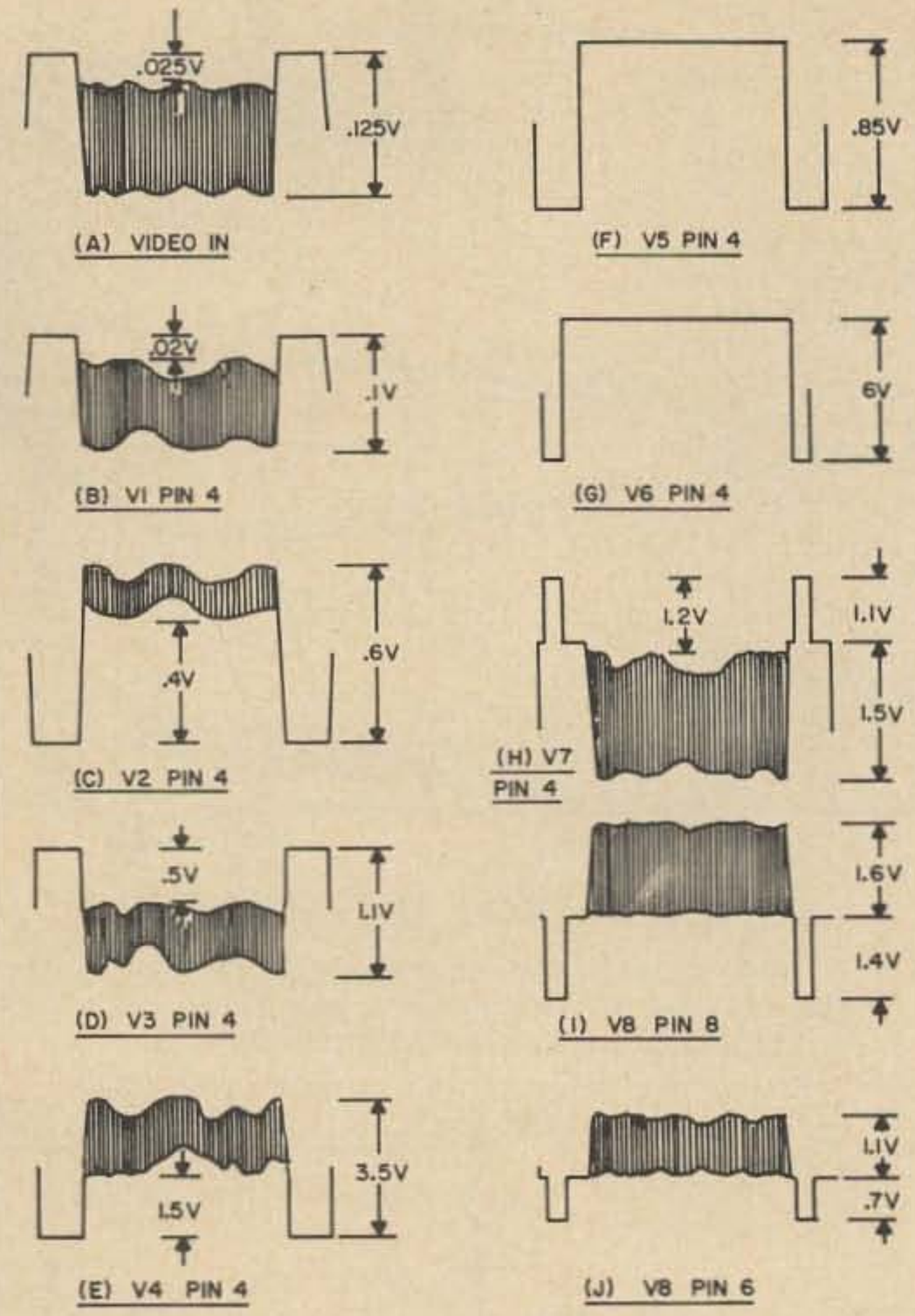

Fig. 4. Sine wave forms at each stage.

be necessary to trim the voltages at the test points to duplicate the wave form amplitudes and clipping levels.

Only the horizontal sweeps are shown. These are representative of what the vertical pulses should be.

The power supply should be well filtered and regulated.

Polarities of all clamping diodes must be observed.

These amplifiers have been in service for the last six years and have been maintenance free.

—W8VCO

Correction

An error has been found in the figures for the Ferris Wheel Antenna in the February issue. In the table on page 23 the figures for 7.3 MHz should be corrected. The loss resistance should be $4.43 \times 10^{-2}\Omega$ and the efficiency figure should be 85%.

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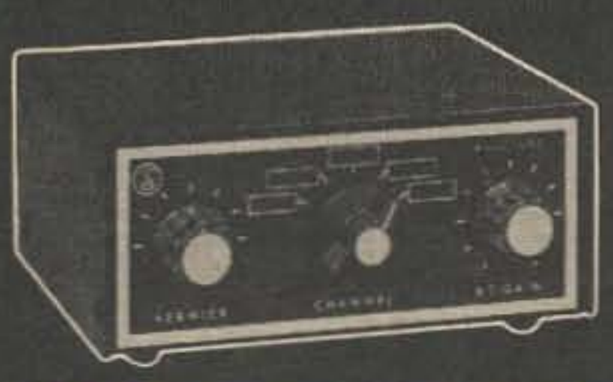

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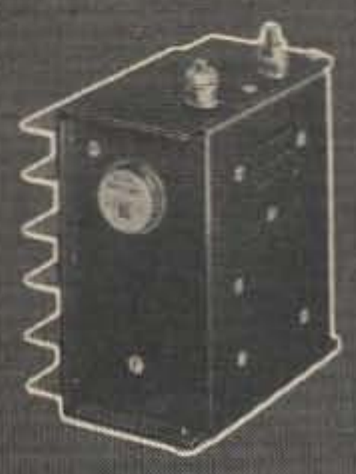

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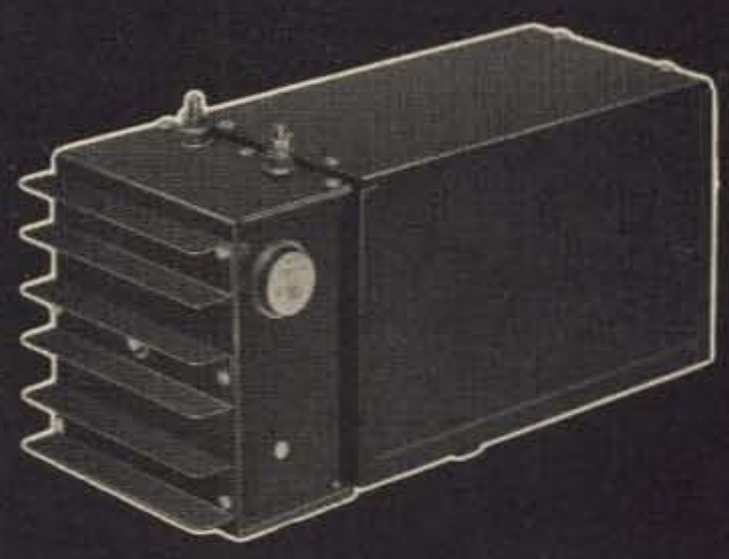

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A Solid Dead-Man

"The Wild 'n wooly winds of worcester (and Shrewsbury), wrecked what Woolner wrought." (phew). Omar Kayam said it, I believe. He was a Persian poet who became a "Silent Pen" about 1130. You don't remember him, and neither do I. Only some of his scribblings remain to say how right he was.

He said, "There is nothing new under the Sun, everything that is, has been". I bet he referred to my tower—and I refer you to 73, July 1967, page 70 . . .

My tower "was" and is now a "has been" . . .woe is me. Now if I had been careful, and not in such a dad-gummed hurry, I would have put that third dead-man in a little more securely. The sad part is that it was up wind from the tower and it eased out of the ground a little at a time, allowing slack to develop in the guy line. A sudden gust of wind snapped it. Anyone want to buy some small pieces of aluminum tubing?

But, I'm not licked yet. It's going up again and this time it's not coming down again.

I'm using quarter inch guy lines this time and the dead-man is being replacing with an automobile wheel, filled with cement (both sides) to which an iron pipe is securely welded and set in a hole about four feet deep.

Woolner's wheel. When this concrete filled automobile wheel is firmly buried, it makes a guy anchor which will not fail.

When this old world begins to shimmy and shake, I'm going to climb my tower, where I'll be safe.

. . . Ted Woolner WA1ABP

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VHF Operation by Remote Control

Remote control operation for the radio amateur using 440 MHz as the control frequency and FM as the control mode.

Who needs it?

When you are mobiling along, trying to maintain an intelligible QSO, haven't you noticed how trees, ignition interference, and tall buildings seem to deliberately obscure the other fellow's most pertinent comments? How hills, obstructions, and QRM wipe out your pithiest responses? Haven't you wished your mobile could sport a 100-foot-high antenna? Or that your transmitter could match the power output of your home rig? It can.

You can drive around town carrying on QSO's with all the armchair-copy characteristics and "getoutability" of the home rig. How? With the seldom discussed but often used technique of remote control. Remote control is the transmitting *and receiving* through a QTH rig from a mobile or less-well-situated fixed station.

It is somewhat surprising that remote control is not in more common use on the ham bands, considering the ease with which it can be achieved and the many advantages it accords the user. A special permit is required for remote control, but this is certainly no obstacle. There are no exams or proficiency tests involved—only the assurance that your remotely controlled equipment won't go wild while you're not there to watch it. It is true, however, that the FCC does impose a few constraints on remote operation. The most important of these are:

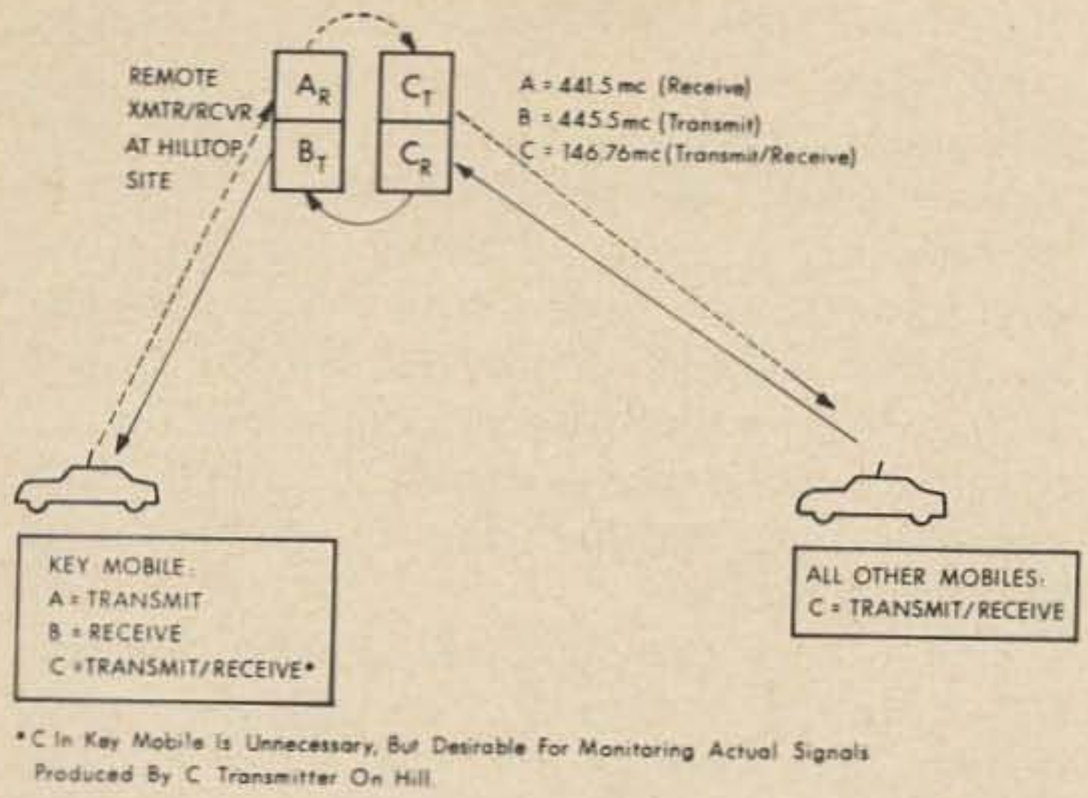
- Input power cannot exceed 900 watts
- Control—but not necessarily operation itself-must be accomplished from a *fixed* station (though it can also be accomplished from a mobile)
- A licensed operator must monitor from the fixed control point while the remotely operated equipment is in use.

The last two conditions may appear as formidable barriers to remote operation, but such is not the case at all. If the XYL is licensed, for instance, she can serve as the monitor while you're mobile, even though you're performing all the control functions from your car. It's just that the primary control point (which, in this case, is where the XYL is monitoring from) must have the capability of overriding any control signals emanating from your mobile. This philosophy assures that the equipment can be turned off in emergencies even when the mobile is out of range.

Another convenient way of complying with the FCC restriction requiring a monitored control point is to set up your remote control system as a joint venture with a few of your friends who operate the same mode and band you do. This idea also offers obvious economic advantages because the cost of the remote control equipment can be mutually shared.

Remote control is ideally suited to group or club participation. One of the chief advantages—outside of cost-sharing—is that a group of participants means a group of locations from which to choose your remote site. (Naturally, you'll want to set up the remote equipment at the best physical location.) Another advantage in making a remote operation into a group project is that remotely operated equipment will be controllable from a number of fixed points, at least one of which should be available for monitoring while others are mobile.

For those who like to know facts or figures before committing themselves to reading a complete article, here they are: A complete remotely operated amateur radio system can be built up—using an existing station—for as



*C In Key Mobile Is Unnecessary, But Desirable For Monitoring Actual Signals Produced By C Transmitter On Hill

Fig. 1. Operation of repeater and remote base station.

little as $200. Or it can cost as much as $1000. It depends on such factors as how fat the junkbox is and the availability of radio-control transceivers—the prime expense.

Here's what remote operation involves:

The already established amateur radio station must be outfitted with a VHF (220 MHz or above) transceiver, which will serve as the control link. The transmitter portion of the control link transceiver will be set to operate on 6 or 8 MHz away from the receiver portion so that the receiver and transmitter can operate simultaneously. It is standard practice to operate the control link transmitter on the higher of the two frequencies.

Each mobile and fixed station wishing to communicate through the QTH rig (or "remote") is then equipped with similar units. But these, of course will be operating on opposing frequencies; that is, the receivers will be tuned to the control link's transmit frequency and the transmitters will be tuned to the control link's receiver channel.

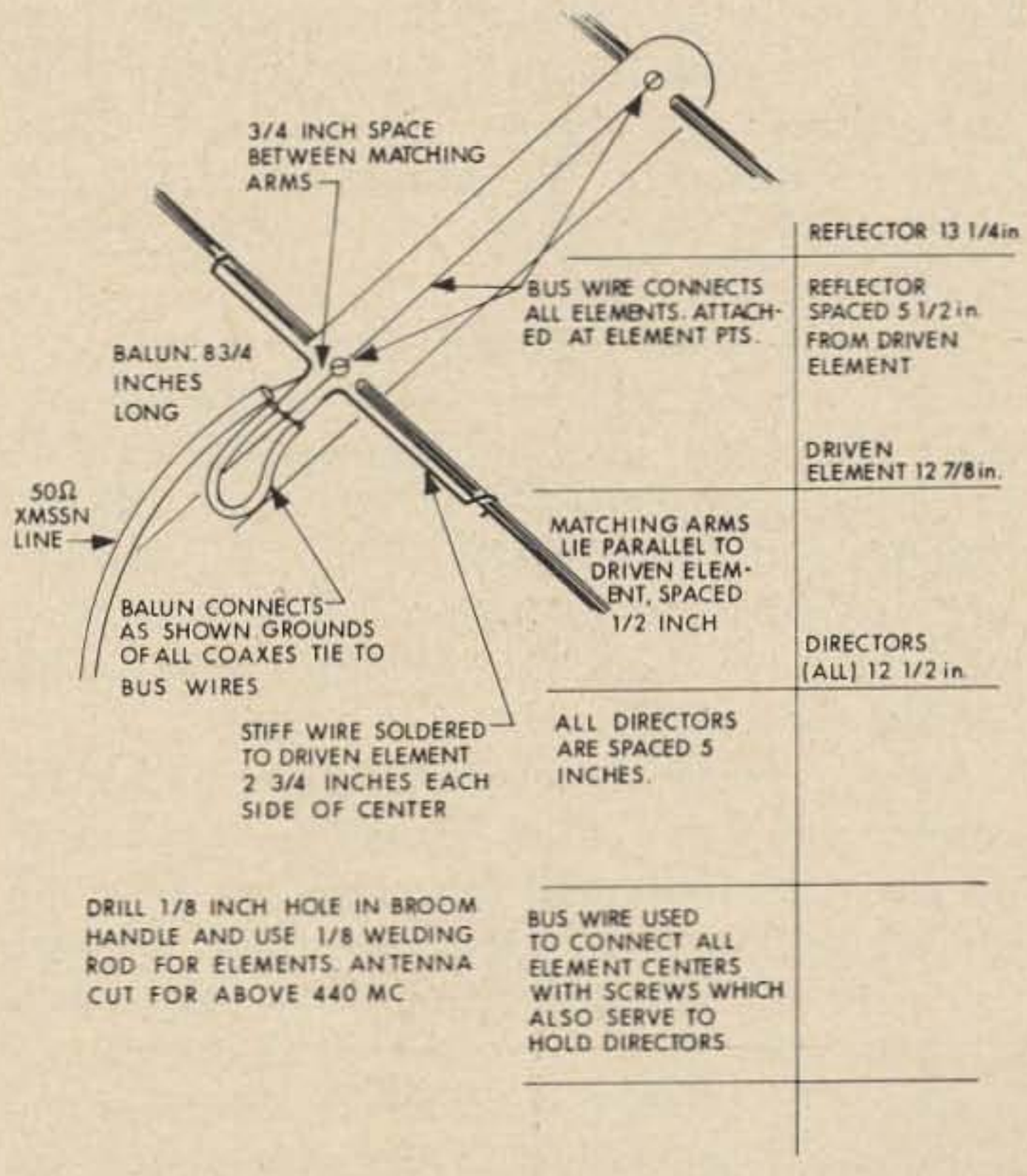
Most remoters use FM for the control mode. FM gear is more readily available than AM and FM offers such advantages as superior noise rejection, greater sensitivity, excellent squelch characteristics, and better audio quality than AM.

Once the control link is established, the QTH rig is interconnected with it so that, on command from one of the control points, any signal received on the QTH receiver is coupled automatically to the control link transmitter, whose push-to-talk relay is keyed as long as the signal is there. The control link receiver (still operating even though the transmitter is keyed) is interconnected so that presence of any signal causes incoming control-link audio to be coupled to the remotely operated transmitter, whose push-to-talk relay is similarly keyed.

Remote operation is particularly well suited to VHF bands, where direct mobile-to-mobile operation is hampered by noise, distance, and physical location. In the Los Angeles area, there are more than 20 remote control stations in use on two and six meters. Some of these started as AM stations controlled on UHF FM, but virtually all have changed their mode of operation to FM. This shift to FM is due partly to the tremendous advantages of FM in the areas already noted, and partly to the nationwide trend toward amateur FM on the VHF bands.*

Typical frequencies (or channels) used across the nation for FM operation are 146.34, 146.70, 146.76, 146.82, and 146.94 MHz on two meters, and 52.525 MHz on six. There are also standard two-meter repeater frequencies on FM: the adopted input is 146.34 and the output is 146.94 MHz.

As noted earlier, there are no rules that compel remote operation on FM, but the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BUS WIRE CONNECTS ALL ELEMENTS. ATTACHED AT ELEMENT PTS.
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BALUN CONNECTS AS SHOWN GROUNDS OF ALL COAXES TIE TO BUS WIRES
STIFF WIRE SOLDERED TO DRIVEN ELEMENT 2 3/4 INCHES EACH SIDE OF CENTER
DRILL 1/8 INCH HOLE IN BROOM HANDLE AND USE 1/8 WELDING ROD FOR ELEMENTS. ANTENNA CUT FOR ABOVE 440 MC
REFLECTOR 13 1/4in
REFLECTOR SPACED 5 1/2 in. FROM DRIVEN ELEMENT
DRIVEN ELEMENT 12 7/8 in.
MATCHING ARMS LIE PARALLEL TO DRIVEN ELEMENT, SPACED 1/2 INCH
DIRECTORS (ALL) 12 1/2 in.
ALL DIRECTORS ARE SPACED 5 INCHES.
BUS WIRE USED TO CONNECT ALL ELEMENT CENTERS WITH SCREWS WHICH ALSO SERVE TO HOLD DIRECTORS

Fig. 2. Multielement yagi for control frequency.

*Marshall Lincoln W7DQS, FM Hams—The New Breed, Electronics Illustrated, July 1967.

inherent advantages make it very attractive. Important points to consider when making a decision: FM rigs are plentiful, inexpensive, and highly reliable; and muting of an FM remote during the no-signal state is extremely simple.

While the FCC requires remote control other than via wire line to be achieved from above 220 MHz, transceivers operating in the 220 MHz band are scarce and costly. FM units operating in the 450-470 MHz band, however, are not. And these units can be easily tuned to below 450 MHz. As a consequence, most amateur remote facilities are controlled in the region between 440 and 450 MHz.

Most cities – particularly the larger ones–have ambulance services, taxi companies, or municipalities with roomfuls of antiquated 450 MHz FM gear that no longer complies with FCC regulations governing commercial use, but which would be ideal for amateur service. Experience tends to prove that these units can be purchased for 35 - 50 dollars each when buying in lots of five or ten. They may run between 75 and 100 dollars if bought individually.

Fig. 1 shows how a remote system is employed. In the system pictured, the remote equipment operates on two meters FM. The control link receives on 441.5 MHz (called freq A) and transmits on 445.5 MHz (freq B). The dashed lines indicate signal flow from the key mobile (remoter), while the solid lines show the return circuit from other hams operating on the established frequency of the QTH rig, which in the case shown is 146.76 MHz (freq C).

Using but one control link, any number of frequencies may be selected for remote operation. My own equipment is capable of operating on 50.4 MHz (AM) and 146.76, 146.82, and 146.94 MHz (FM). Rig switching and channel changing is easily accomplished from the remote control point with simple control devices.

If you *really* want good results and maximum coverage during remote operation, locate the equipment on a hill or in a tall building. The U.S. Department of Agriculture, Forest Service, controls a large percentage of the acreage in mountainous regions. In 1965, the Forest Service adopted the policy of leasing land to amateurs for radio remote control applications. For an annual fee of $25, you can be assigned a good hilltop location (if there's one near you) and build your own shack there for radio gear to be used from a remote control point. Southern California is rich with such sites in the national forest reserves. At one site, near San Dimas, California, the government has turned over some 19 acres of prime hilltop land for amateur use. There, a small group of us pooled our limited resources and constructed a small brick building that satisfied the requirements of the Forest Service.

Using gear that we collectively donated, we installed a three-band amateur radio system and operate it as a joint venture. Since the hilltop is twenty miles or so from the nearest of us, we take turns trouble-shooting when one of the remote transmitters malfunctions.

Remoting offers a number of fallout advantages over direct mobile and station operation. For six-meter hams, an obvious benefit is the absence or minimization of television interference. Another is the reduction of noise at the operating point. The FM gear you'll be using for control won't be susceptible to QRM from ignitions, power lines, and the like. And there will be no QSB as long as you're operating within good two-way range of the remote site. If you're 5 - 9 when you leave home, you'll be 5 - 9 at your destination–subject to normal fluctuations attributable to band conditions, of course.

Are you sold? All set to get some gear and start operating via remote control? All right! Send now for FCC Form 610 so that your license can be modified to include remoting. Then start looking around for:

- A good location
- Some buddies to share the expenses and fun
- A bunch of old 450 MHz taxi or police radios (If you have trouble locating them, drop me a line)

And while you're at it, why not consider operating on one of the NEW BREED FM channels on six or two?

Get your workshop in order and get ready to build.

Preparing the Equipment

When a discussion of remote operation comes up, there are always those who will use the terms "repeater" and "remote" interchangeably. To salty remoters, the two are completely different, though related, things. A repeater is operated in-band–

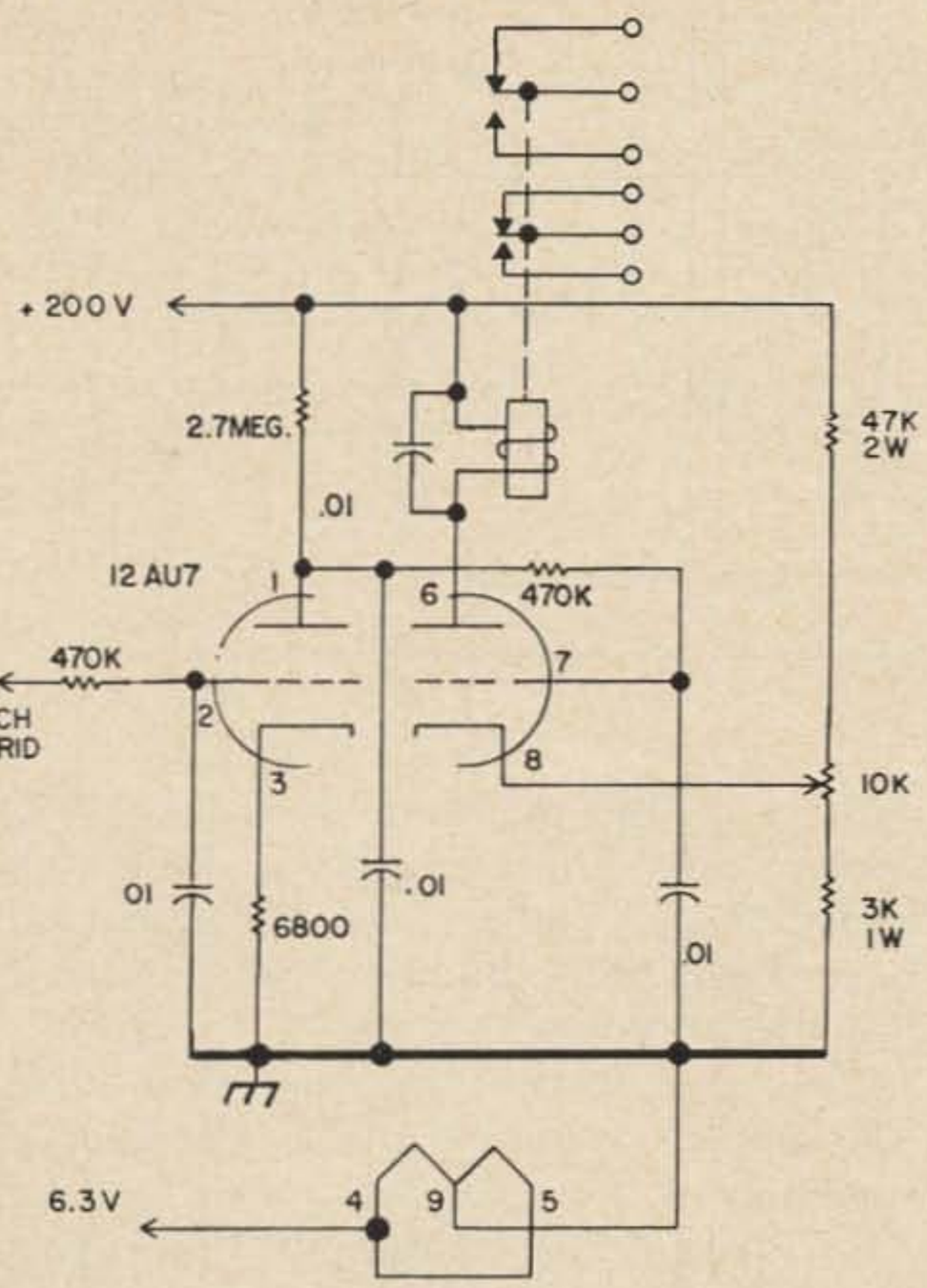

Fig. 3. Schematic diagram of carrier-operated relay.

that is, it retransmits whatever comes into a receiver tuned to an *adjacent* frequency in the same band. A remote is a fixed-frequency station (generally) which is operated and controlled from a completely different band. A remote installation usually involves a repeater on the control link frequency, and a repeater (except when wireline-controlled via a leased telephone pair) virtually always does.

To be entirely successful, the control link should itself be a complete and independently operable repeater. Using 450 MHz FM as the control link simplifies construction of the repeater portion of your remote station because the equipment is inexpensive, handbooks and circuits for the used commercial gear are readily available, and usually no special rf shielding is required.

The most commonly available makes of used 450 MHz FM gear are GE and Motorola, though occasionally one finds a "fleet" of such makes as DuMont (Fairchild), Kaar, Aerotron, or RCA. They're all relatively well known, but documentation for GE and Motorola is easiest to come by. Used mobile units sell for about one-half to one-third the price of a 115-volt unit (called a base station). So it is felicitous, if you're so inclined, to use a mobile unit for the base station by building up an ac supply.

A typical mobile transceiver, such as Motorola T44 or GE's Pre-Progress Line (or, in the jargon of remoters, simply Preprog) requires around 500 volts at 150 mA (minimum) for the final amplifier, 350 volts at 60 mA for the final multiplier, and 250 volts at 150 mA for the oscillator, multiplier, and receiver section. A negative bias voltage of around 25 volts is also required for the transmitter.

Tuning up these commercial FM units is a breeze. Each stage that requires tuning terminates at a test point designed to accept the prods of an ordinary VOM. GE Preprog units are the epitome of simplicity. Each test point is plainly marked and is positioned in the proximity of the adjustment point. Tuning of transmitter—and in many cases receiver—stages involves monitoring of the test point with a 0-3 volt dc meter and adjusting slug for maximum meter deflection.

The test points of Motorola T44's are pin jacks of a standard 11-pin socket, and are designed to be monitored with a 0-50 microampere meter.

This article will not go into such items as power supply construction or radio tuneup, as these are aspects which will vary according to the vintage and make of FM rig.

You'll find that, invariably, all commercial FM transmitters and receivers are crystal-

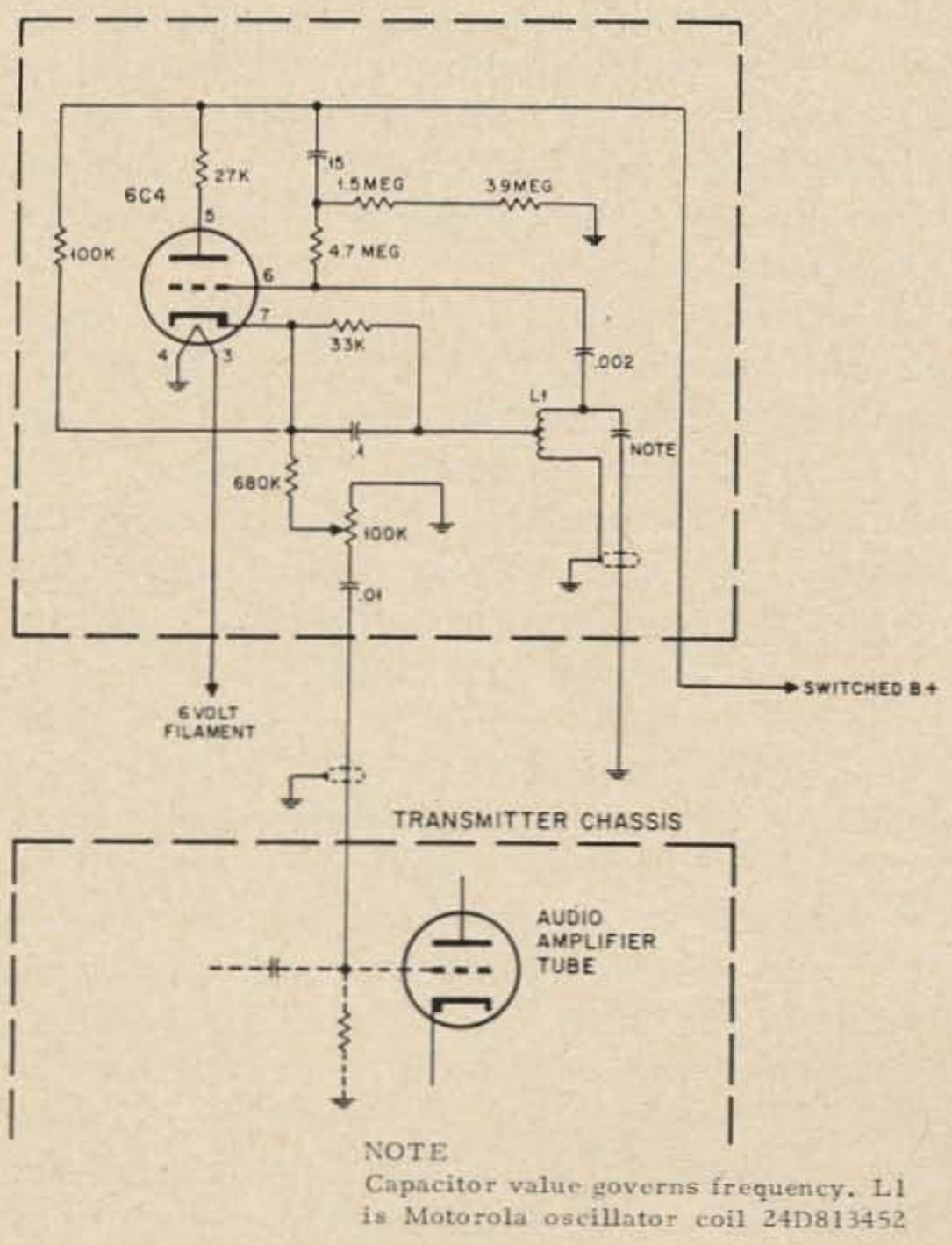

Fig. 4. Single tone oscillator.

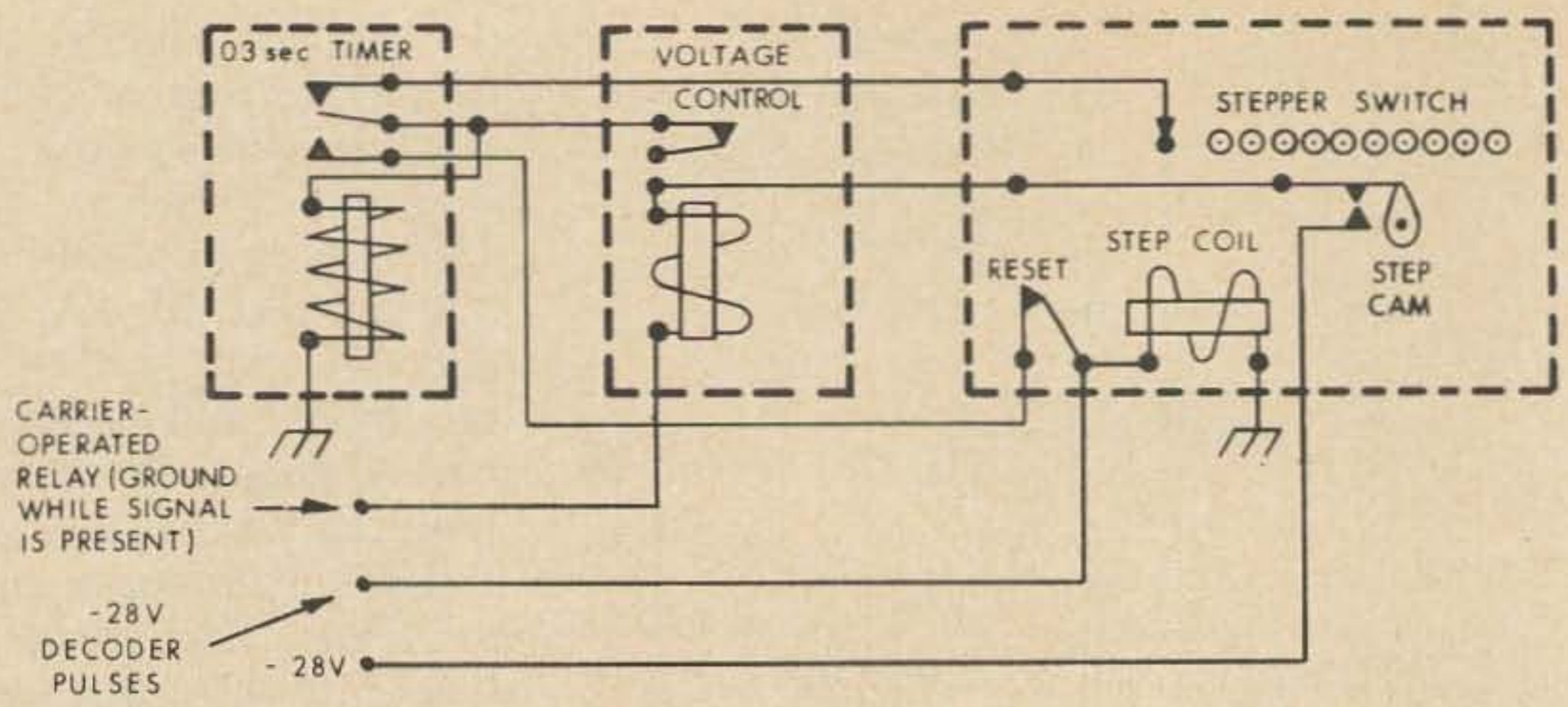

Fig. 5. How pulses from the decoder (not shown) can be used to drive the stepper.

controlled. Don't make the mistake of buying crystals for your transmitter before you are certain as to the fundamental frequency and know the circuit in which the crystal will be used. If you are in doubt, mail a copy of your oscillator circuits (any crude sketch is OK) to Sentry or International Crystals and mention the model number, manufacturer, and the approximate date of manufacture of the equipment you've got, as well as the desired operating frequencies for transmit and receive. They will grind the crystals for you and mail them COD. The International crystals will cost you a bit more than you'd have to pay if you bought them from another source, but you can be sure they will oscillate—and be dead on frequency at that. (A self-addressed stamped envelope to me will bring you prompt crystal frequency information on *any* Motorola or GE unit. This data has been prepared on a computer tab run and is available to all interested amateurs.)

The transmit frequencies should be judiciously selected so that no multiple of the oscillator frequency falls within pull-in range of any of the receivers (including *if*'s). Without consideration of these factors, the emission of one of the transmitters can seriously desensitize the control link receiver.

GE units often come equipped with cavities, which help greatly to eliminate adjacent-channel interference. If the two control link frequencies are well spaced, however, you shouldn't need a cavity. Two antennas must be provided for the control link, too. These should be *vertically* separated as far from one another as possible.

Antennas are simple to construct for the 450 MHz region. An adequate groundplane can be built in 15 minutes by connecting 6-inch pieces of brass welding rod to a chassis-mounting RG-8/U connector. According to the mandate from the FCC, the control point must employ a directional antenna. **Fig. 2** shows how a simple yagi can be constructed from a broom handle and a few pieces of welding rod.

The next step is the one that turns the 450 MHz system into a repeater: construction of a circuit that senses presence of a received signal and keys the transmitter push-to-talk relays so that received audio is coupled automatically to the transmitters. Where the operating mode for the remote facility is to be FM, the switching function is easily achieved with a carrier-operated relay, which becomes an integral part of the receiver's squelch circuit.

Its principle of operation is simple: When no carrier is present, noise would ordinarily appear at the loudspeaker. A good FM receiver couples the higher-frequency components of this noise to a noise amplifier, the output of which is rectified and fed to a squelch amplifier which keeps the audio amplifier in a cutoff state as long as the noise is present. But when the noise disappears, indicating the presence of a carrier on the frequency, the audio ampli-

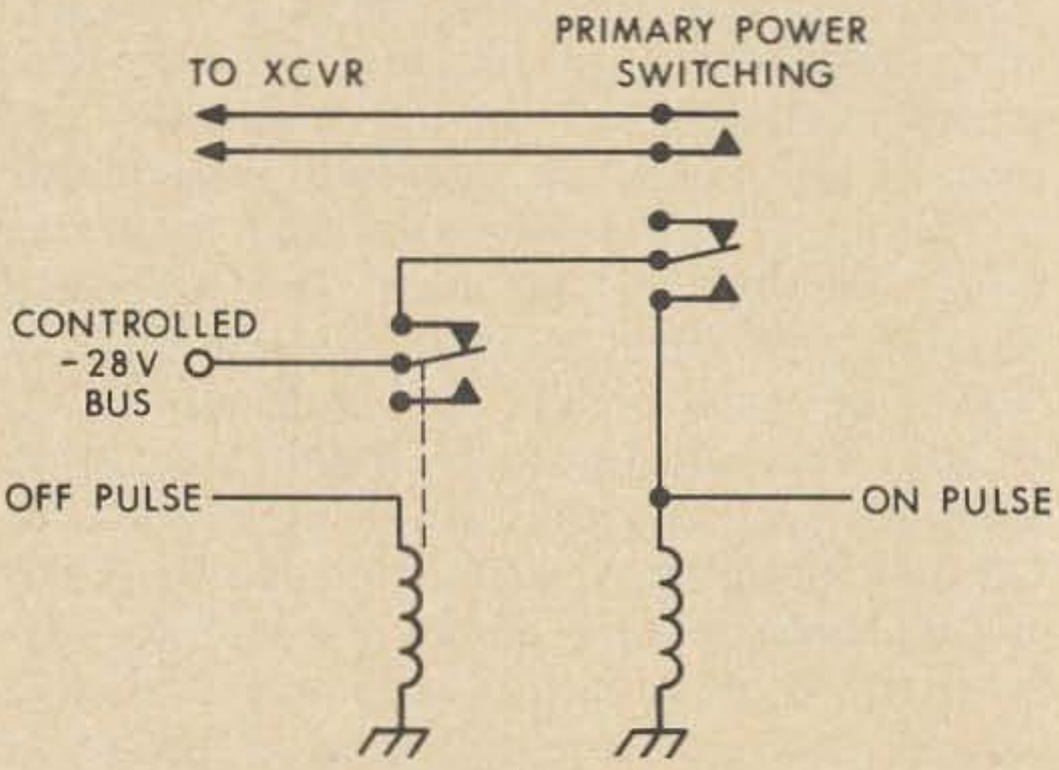

Fig. 6. Electrical latch relay for on/off function control.

fier comes on. A dc amplifier with a sensitive relay in series with the plate lead can be driven with the same signal supplied to the squelch amplifier, so that contact closure results from the presence of a legitimate audio signal. When the noise disappears, the contacts will of course immediately reopen. The schematic of the carrier-operated relay, **Fig. 3,** shows its simplicity and gives details on how it may be connected to any conventional FM receiver.

The mechanical relay portion of the circuit is a standard plate relay with a coil resistance of 8 - 10 K. The contacts energize the push-to-talk circuits and allow audio switching.

With a carrier-operated relay (on the control receiver) to operate the control link and remote transmitters, the repeater portion of the system is complete. It is also desirable, but by no means essential, to connect this type of relay to the remote receivers. Without it, the control link transmitter will be keyed continuously during remote operation, regardless of whether the remote operator is transmitting or receiving. This can be a little rough on finals. If you intend to operate this way, a blower on the 450 MHz final amplifiers is a must, whether you'll be running five watts or fifty.

Command and Control

The most important aspect of any remotely operated station is control. And the nucleus of a remote system is its command and control circuitry, or "brain."

Control is probably simplest using a tone system whereby control points (and mobiles, if desired) are equipped with fixed-frequency audio oscillators, called *encoders*, while the control link receiver at the remote site is provided with a simple frequency-to-dc converter, or *decoder*. The audio frequency to be used is immaterial so long as the encoder and decoder are matched. It might be wise to remember, however, that higher audio frequencies (2500 to 3000 Hz) are further removed from the voice range, so decoders on these frequencies are less susceptible to voice tripping.

The decoder does nothing more or less than provide relay contact closure when the proper tone appears at the control link receiver. But by connecting a stepper switch to the decoder, and using a conventional telephone dial to pulse the encoder, a minimum of ten discrete functions can be controlled—one for each digit of the dial.

Fig. 4 shows a schematic diagram of a common single-tone oscillator often used for control applications. The unit is easy to build and fits into a standard Minibox chassis. The output is high impedance and should be fed to the grid of the speech amplifier at the control point.

The decoder, somewhat more difficult to build than the encoder, is a small, commercially available unit that sells for $15 to $25 used. (If there is no source in your own area, decoders may be purchased by mail from Mann Communications, 18669 Ventura Blvd, Tarzana, California.) Robert Mueller (K6ASK) has designed a completely solid state encoder with matching decoder that is satisfactory for control.* His design is not as inherently stable as commercially produced units, but has proved adequate for this application.

Since the frequency of the encoder can be shifted anywhere within the usable audio spectrum by varying its key capacitor, this portion of the system may be constructed before you have decided on a decoder.

After the encoder and the decoder have been set to the same frequency, the encoder may be installed in the control point transmitter as shown in the schematic. The decoder should be installed in the control link receiver so that audio from the discriminator is coupled to the decoder input. The decoder output can then be connected to a standard stepper switch to provide the basis for the command portion of the brain. **Fig. 5** shows how pulses from the decoder (not illustrated) can be used to drive the stepper.

In the circuit shown, voltage is kept from the wiper arm of the stepper switch until the digit has been selected and the contracting arm has come to rest at that point. In addition, voltage is removed from the arm as a prerequisite to resetting the stepper to its zero (home) position. With this approach, the wiper arm only sees voltage when the stepper has been engaged, but never during the actual stepping process.

As soon as the wiper arm moves, the step cam contacts close to energize the 28-volt dc bus (relay control voltage). This 28-volt

*Coltin, L. (K6VBT), "Stable Tone Units for Remote Radio Control," FM Bulletin, January 1968, VDB Publishing Co., 2005H Hollywood, Grosse Pointe, Michigan 48236.

signal is prevented from getting to the function selector deck by the voltage control relay, whose contacts are held in by the ground signal from the carrier-operated relay. When the carrier drops, the ground signal disappears and the controlled voltage is applied to the function selector (wiper arm) where it must perform its control function within a very brief time span (0.3 second in the case shown). In summary, when the stepper has been properly pulsed (as with a tone pulse train from an encoder driven by a telephone dial), the operator drops carrier, and the voltage control relay opens to apply wiper voltage through the timer. At the end of the 0.3-second period, the timer pulls in to supply voltage to the stepper reset contacts. (These contacts pulse the stepper rapidly until the step cam contacts open, at home position.)

Using the momentary voltage pulses which appear on the selected contacts of the stepper to perform useful functions is a simple matter with latching relays. Five latching relays will control ten functions (five "on" and five "off"). **Fig 6** shows how an electrical latching relay can be built from two standard relays.

With the electrical latching relay, an "on" pulse from the stepper applies a brief voltage pulse to the coil of the primary power switching relay. The relay stays closed even though the pulse is removed because continuous coil voltage is applied through the made contacts of the "on" relay itself. The voltage is obtained through the normally closed contacts of the "off" relay. When power is removed or lost or when the "off" relay is pulsed, voltage is removed from the "on" relay and the function must be selected again with the stepper to reenable it.

Electrical latch relays provide the kind of fail-safe operation that pleases the FCC when its engineers consider an amateur's plans for a remote facility.

If there is a telephone at the remote site, a very useful and inexpensive mobile telephone system can be built into your control circuit. It would probably be a good idea to check with the local telephone company before making any connections. however.

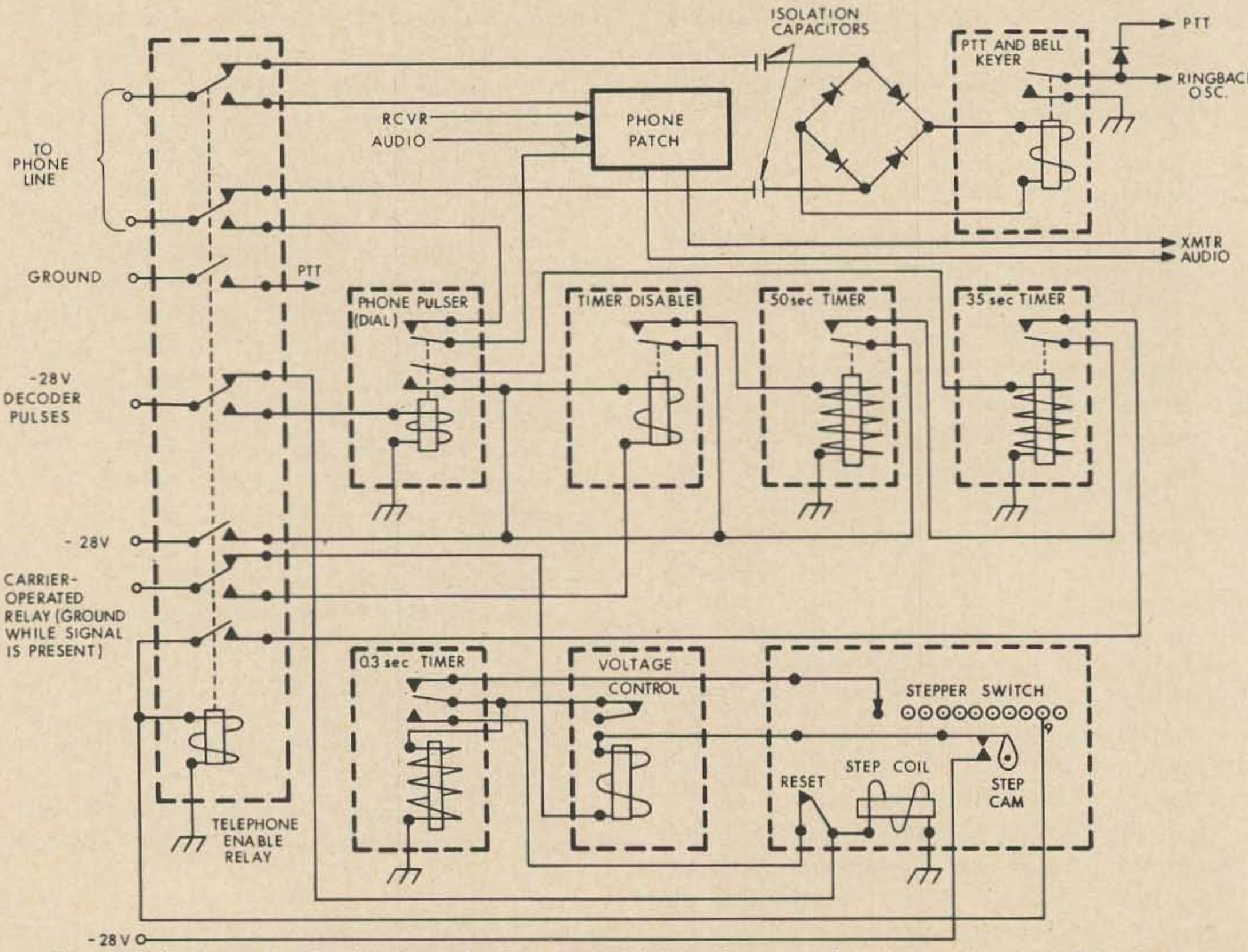

Fig. 7. Telephone circuit which can be incorporated into the control system with no modifications to the existing circuitry.

The telephone circuit of **Fig. 7** was designed by Fred Daniel, W6NQS. It can be incorporated into the control system with no modifications to existing circuitry. The beauty of it, aside from its simplicity, is its flexibility. Mobiles using the system can initiate calls or answer the telephone when it rings at the remote site; the telephone itself can be used to control shutdown functions if you want to use the stepper for ten "on" functions; and the installation will cost but one contact of the stepper.

The conventional telephone uses but two wires to accomplish what may amount to a multitude of functions. There is typically a low-voltage dc level across the lines to drive the carbon microphone element. When the telephone rings, however, a higher-voltage ac signal is superimposed on the lines to energize the bell.

The control circuit of **Fig. 7** takes advantage of these characteristics so that the line can be continuously monitored for incoming landline calls without disrupting the normal control functions of the remote radio installation. While the control portion of the system (lower three enclosed squares of the diagram) is in normal use, the phone lines are sensed for the presence of an ac voltage (indicating that the phone is ringing). The lines are fed through a set of normally closed contacts on the telephone enable relay to a bridge circuit. The dc component of the line should be isolated by placing a capacitor in series with each conductor of the telephone pair. A sensitive plate relay (with a coil resistance of 8 -10K ohms) on the output of the bridge rectifier pulls in when the phone rings and keys the push-to-talk of the control link transmitter for the duration of the ring. The momentary closure of the sensitive relay can also be used to trigger an oscillator or other signaling device so that when the transmitter is keyed by the phone, a ring signal is generated also.

The diode in the circuit keeps the ring-back oscillator from energizing each time an operator keys the push-to-talk. The diode, of course, must be reversed if polarity of the system is not as shown in the schematic. The system depicted here uses negative 28 volts because the power supply was doubling as a bias voltage source for several transmitters.

The ringer may be a simple relaxation oscillator such as the one shown in **Fig 8.** This may be constructed in a few minutes with a couple of capacitors, a resistor, and a neon lamp. The device shown delivers a varying pitch tone that is easily identifiable at the receiving end.

When the remote operator wants to place a call or respond to a phone ring, he dials a preselected number to energize the telephone enable relay (the digit 9 in the case shown). Here's what happens in the control portion of the system when a 9 is dialed:

The - 28V decoder pulses (one for each digital increment, or a total of 9) are fed to the stepper coil through a set of normally closed contacts on the telephone enable relay. With each pulse, the stepper moves one position. The step cam contacts of the stepper close when the stepper is first energized and do not open again until after reset has taken place.

It should be noted that some steppers do not have these step cam contacts. Their function can be simulated, however, if the stepper has an extra deck with its own wiper arm. The function is achieved by bussing all the contacts of the extra deck together and running a lead from this buss to the voltage control relay (where the step cam connects on the diagram). The wiper arm, forming the other contact of the make-shift switch, is connected to the 28-volt source.

When the stepper moves from its home position, a 28-volt potential is applied to the voltage control relay, whose contacts are pulled in as long as the dialing operation is taking place. (This is accomplished because the ground side of the relay coil is supplied from the carrier-operated relay.) After the 9 is dialed and the control-frequency carrier disappears, the voltage control relay drops out, applying voltage to the 0.3-second timer, which feeds the 28-volt signal to the stepper wiper through its own normally closed contacts. At the end of the 0.3-second period the timer pulls in, removing voltage from the wiper and applying it to the stepper coil reset contacts. When the stepper resets, the step cam again opens and control voltage is removed from the system.

The selection sequence described above completes but one function: It causes a 0.3-second, 28-volt signal to appear on the ninth contact of the stepper. That short signal causes the telephone enable relay to pull in and lock itself in the energized state. A constant voltage from the 28-volt buss is applied to one of the normally open contacts

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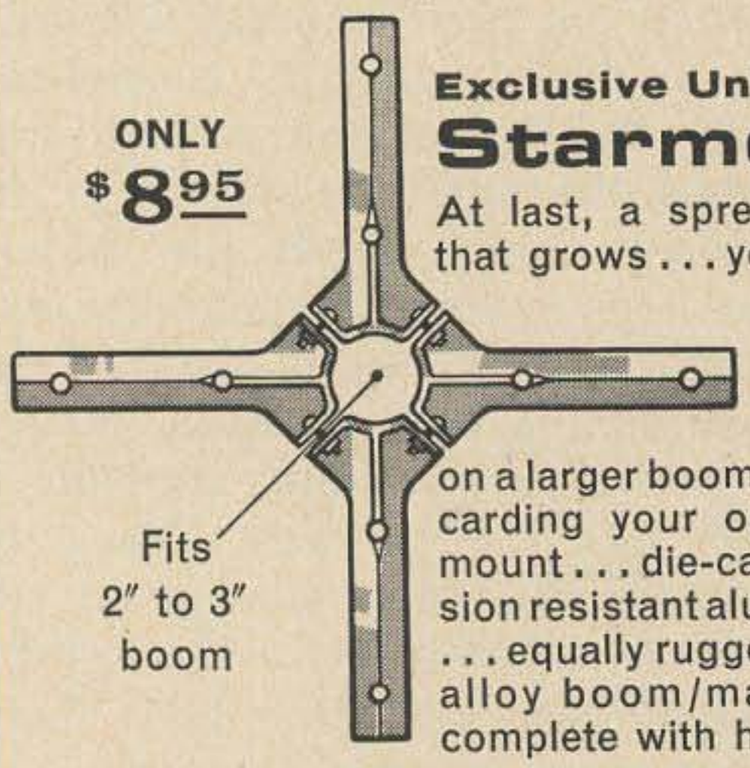

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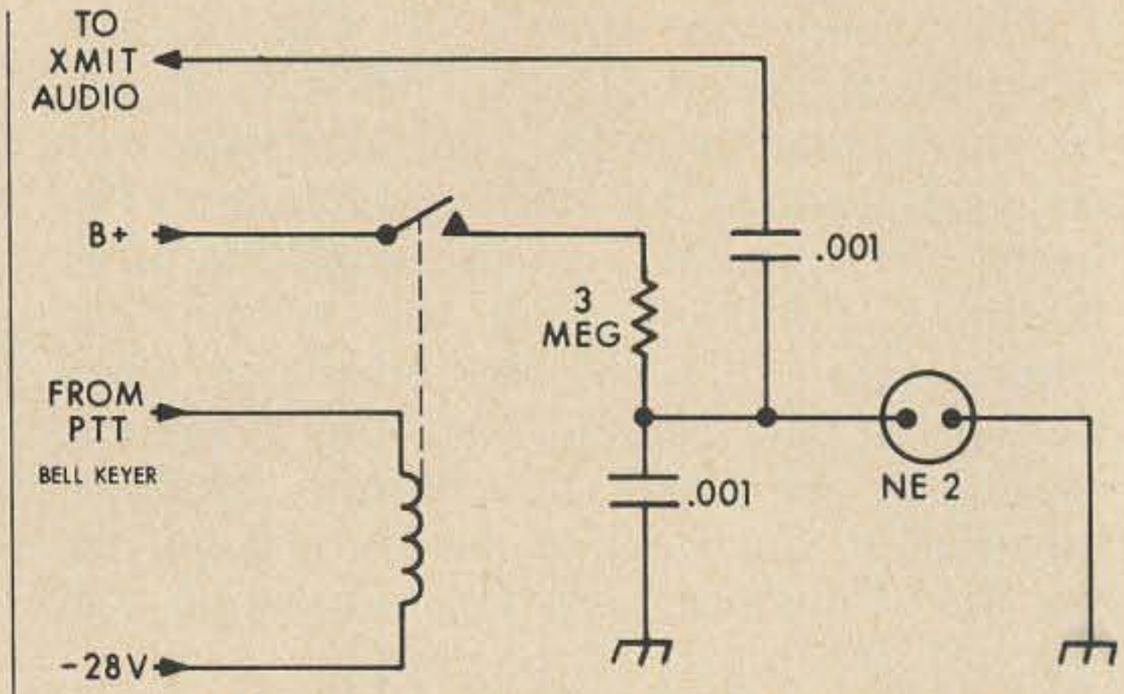

Fig. 8. Relaxation oscillator for effecting telephone ringback.

of the telephone enable relay. Thus, when the relay pulls in momentarily the buss voltage is transferred to the relay coil to hold it in. In this case, the voltage is passed through the normally closed contacts of two timers in the telephone circuit, both of which are used to remove coil voltage (and thereby accomplish telephone hang-up) under certain conditions.

With closure of the telephone enable relay, the phone lines are disconnected from the rectifier circuit and fed directly into the phone patch for audio mixing and transfer. The decoder is coupled to the phone pulser relay so that additional dialing will pulse the phone line rather than the stepper. The push-to-talk of the transmitter is keyed continuously. A ground signal from the carrier-operated relay is supplied to the timer disable relay as long as the remote receiver is receiving a signal.

After a telephone conversation has been completed, hang-up may be achieved in either of two ways: The operator may drop his carrier, causing the timer disable relay to close and supply coil voltage to the 50-second timer. At the end of its period, the timer opens to remove coil voltage from the telephone enable relay and return the control system to its normal state. As a quicker alternative, the operator might want to accomplish hang-up by transmitting a continuous tone. This causes a continuous 28-volt signal to appear on the coil of the phone pulser relay, holding it in so that a steady voltage is applied to the coil of the 5-second timer. When the timer pulls in, coil voltage is removed from the telephone enable relay. The phone is ready to accept other calls, and the stepper may then be used to select other functions.

The telephone lines can also be used for control of remote functions. It makes a very comfortable backup system for shutdown when a remote transmitter gets stuck on the air or the decoder blows a tube (or transistor). Soundness of overall design notwithstanding, such things *can* happen. For shutdown, simply connect a relay to the bell keyer (shown in upper right corner of schematic **Fig. 7.** A control-voltage signal on the relay can then be routed through individual diodes to as many latch relay "off" coils as desired.

If a stepper switch is connected to the bell keyer, each sequential ring can be used for control of a separate function. To discourage unwarranted control from "wrong numbers" and casual calls, the first seven or so contacts of the stepper should remain unused. In this way, control won't be initiated until the phone has rung at least that many times.

The control elements discussed in this article were *command* functions, as opposed to passive control measures. Passive control includes automatic logging of calls; automatic, timed station identification with a tape playback unit; automatic shutdown in the event of failure or loss of control; transmission-length limiting devices; and function-monitoring techniques. These will have to be discussed in another article. We're out of space.

. . . K6MVH

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T-37-2	.37	.21	.12	.40
T-25-2	.25	.12	.09	.30
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T-80-6	.80	.50	.25	.80
T-68-6	.68	.37	.19	.65
T-50-6	.50	.30	.19	.50
T-25-6	.25	.12	.09	.35
T-12-6	.125	.06	.05	.25

Black "W" Cores-30 MHz to 200 MHz- $\mu = 7$

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An Invisible Antenna

Since the beginning of radio communications, antennas have been constructed from metal conductors. These antennas have taken all forms from a single piece of random length wire to elaborate trapped yagi beams for multi-band operation. The handbooks are full of antenna designs to suit each individual need for an antenna to work on the desired frequencies.

The one thing all these antennas have in common is the need for some form of support. These supports also cover a wide range. They vary from a simple wooden "A" frame mast to self supporting 100' towers embedded in tons of concrete. They crank up and down, fold over in the middle, or are laboriously climbed by the young in heart and body. For the most part, they require miles of guy wires which are invariably tripped over by the neighborhood children and lead to law suits amounting to thousands of dollars in damages. A tower, in legal terms, is classed as an attractive nuisance. Where there is a tower, a child will feel compelled to climb it. He (or in the case of tom-boys, she) will invariably get hurt and the parents will take this opportunity to sue. There goes your life savings.

In addition to the above hazards, the apartment dweller or the ham with antenna restrictions from antiquated zoning laws is continually bemoaning his lot in life and is restricted to the use of antennas which are neither visible nor require a support of any kind.

These unfortunates go to all extremes to hide their ham activity. They fold dipoles in the attic; wrap miles of wire under the eaves of the house; have ingenius devices to erect the antenna after dark and collapse it during the daylight hours; and even pretend to be CBers. These poor souls live in fear that their neighbors will catch them at their hobby.

A solution has finally been reached. Why do we continue to construct these massive arrays? I suppose it is tradition. Like the guy who votes with a certain party because his grandpa and his pa did, so he does too. If it was good enough for them, it's good enough for him. Here we are in the space age with semiconductors replacing tubes, integrated circuits being used in place of racks of equipment, and we still stick with the age old metal element antennas!

It may come as something of a shock to most of you that the world of antennas does not begin and end with metal conductors. Ionized air makes a perfectly fine conductor, and can be used to construct a more than adequate antenna for all needs. It eliminates any need for a tower or other means of support. In reality it is a very simple process.

A rod, or column, of air may be ionized either by the use of radioactive materials, or by using an X-ray machine. In the first instance, an arrangement using radioactive materials set deep within the bore of a lead cylinder may be used. A pivot device at the base at ground level makes aiming of the antenna possible to give maximum gain in the desired direction.

Since radioactive materials have created a dumping problem for the agencies who are experimenting with them, it should only be a matter of a brief time before they become available on the surplus market.

The X-Ray method would be a bit more expensive, and considerably more complicated to execute. This requires extreme high voltage dc to be fed into the tube. It's target then emits a powerful stream of X-Rays to ionize a column of air. The target support can be of the same type as the one using the radioactive material, but would require more shielding and protection from the weather since the actual machine would be the source of the beam.

Since lead shielding is required in either case, I would suggest that you begin stocking up on this material before the demand becomes great and the price goes up. I would also suggest that if you have any tower sections lying around, you get rid of them in the near future before they become obsolete.

. . . W1EMV

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Using Your Electromagnetic Wave

A long, long time ago, a hairy hominid sat upon his haunches, and stared with a newly awakening interest at the campfire before his cave. He noted the smoke rising vertically over the African landscape, and then gently rippled the grey-black currents with his hands. A ragged puff was formed, an unusual, unnatural effect. Perhaps it would cause notice, he thought. Perhaps he could call Ur, over in the next valley.

Over the centuries, first our hominid and his friend, Ur, and then their descendants experimented with this novel means of communication, this way of extending their voices. They noted that the insertion of certain types of vegetation into the fire would provide a darker, and hence more visible, column of smoke. They discovered that the use of an animal skin in lieu of one's hands was much more efficient in forming the signal. They developed a code of sorts. And one day, our hominid's descendants were delighted to read the message from the other valley that almost had to say: "Ur sig 59 hr OM, name is Mu."

And then they went on to more important things.

They began to communicate with one another about the problems of their day. "Food here." "The men from the Serengeti are attacking the village." "Animals are near." "My daughter needs a husband."

They went on to more important things.

Thousands of years later, I, a radio amateur, sat at my desk in Dallas and communicated with a fellow named Peter in Pitea, Sweden. After a brief exchange of electromagnetic fields at the speed of light, I was possessed of the information that my signal had indeed reached Sweden in fairly readable form. He was little better informed than I. We did not go on to more important things.

It was a contest of course. Admittedly, but for the contest, he probably wouldn't have been on the air. But still! Zip! Forty-five seconds! What result? "5-7, name is Peter; 5-8, name is Don."

I became intrigued with this voice from beyond the sea, this man named Peter 5700 miles away. I discovered his QTH in the callbook, and dug out an old *National Geographic* map. There it was, Pitea, a small town near the arctic circle, on the Gulf of Bosnia. What sort of place was Pitea, I wondered. A port, no doubt. Was it also a manufacturing town? An agricultural center? What sort of climate would there be near a large gulf at that latitude?

But most of all, what of Pete? Did he have a family, a home? What were his interests, his ambitions? Was he Catholic, Protestant or Jew? Did he have other hobbies? Could he perhaps garden during the long days of summer? Do the long winter nights depress him?

How does he support himself, or his family? Is he a doctor, a sailor, a lawyer, a forester?

And of most interest, my little boy's question: "Has he ever seen a reindeer?" I wonder too.

And was he curious about that far off place called Dallas?

"5-7 in Sweden; 5-8 in Dallas, 73 old man."

Are we squandering a birthright?

Isn't it time we moved on to something more important?

We have the technical ability, and a political license, undreamed of during the long history of man on this planet. We have at our fingertips, and under our practical control, the only known constant in the universe, yet we persist in communicating an insipid jumble of numbers and names, briefly noted and quickly forgotten.

We should be entering a new age. We are, instead, squatting, not unlike that hairy predecessor of ours, and metronomically assuring ourselves, over and over, that the signal is getting out. Or we persist in describing our equipment, and the minutiae of our problems, and the airways choke with the endless stream of 811A's in grounded grid that seem to me to proceed through my

speaker to infinity and back. We are discussing the means, not the end.

I realize that a lot of my fellow amateurs enjoy contests. I respect their right to their opinion, even though it may strike me as sheer idiocy to spend eighteen to twenty hours exchanging numbers to obtain the immense privilege of having a call-sign printed in six point type among thousands of others. And I respect the desires of others to collect awards, although that activity seems more akin to stamp collecting than to a communications hobby or service, and has become ludicrous in many instances. "Work six eskimos for the Polar Bear Award! Special endorsement for SSB." Now really!

But, as I say, I respect my colleagues' right to enjoy their hobby in the way they see fit. No, I do not call for the abolition of contests or awards. Nor do I suggest that every DX contact become a ragchew. It is impossible in view of our numbers. But I worry, gentlemen. I worry about our image. I wonder about our casual disregard of our unlimited power to increase understanding on this troubled planet.

So how do we begin to extend ourselves, to move on to more important things. I would suggest two ways. The first is quite simple. The second requires a little work. As a starter, why not simply avoid the two most common subjects of conversation, the rig, and the weather, and substitute questions about the other man's family, his anticipation, his other hobbies or interests. The weather is, after all, transitory. And the description of the rig tells us nothing of the man, or his society.

Secondly, there is an indirect approach, the use of that forgotten document of courtesy, the QSL card. Here again, we send mostly numbers and abbreviations, and descriptions of the rig, and perhaps a short "tnx fer QSO." Instead, how about a Polaroid snapshot of our house, or our children, an interesting note, a question or two. Send a comment about anything *but* our rig and our signals. Tell them of our occupations, our thoughts, our plans. Tell them of your city or town, of how the mayor is elected, your opinion of miniskirts, the ecology of the surrounding countryside, the school system, the sports that are popular. Anything to *communicate!* To show people we are not all long haired hippies, or hate mongers. To show that we are a normal people, with the thoughts, dreams and ambitions of others, everywhere. And perhaps, they will respond in kind.

Expensive? A little. More trouble than expense, really. But try it with, say, every tenth DX contact and see what happens.

May I now respectfully bow toward the memory of The Old Man. May I bow also to all those wonderful old timers, (my father was one) who built our hobby with their endless and painstaking experimentation and gave us this control over a mysterious cosmic force. And a third, and final bow to those who by training and ability are able to continue this experimentation and research. I envy their minds, and their prowress.

But after those bows, may I suggest a turn to the future. To the future of unlimited world communication. To the extension of understanding throughout the world, perhaps as difficult a task as designing a transceiver. May I suggest a turn from outdated operating techniques, from the concept of a relay organization, from T.O.M.'s cat and the wouff hong, and those other antiquities.

Can we not feel a stirring within us like that of our hominid friend after he had established the reliability of his system. Can we see something more wonderful in the smoke? It can be used for so much more.

Perhaps even Mr. Maxim would agree. Perhaps he would, in 1968, transmit something that, freely translated, would say: "I don't give a damn about the signal report. What's new in Sweden this fine day?"

. . . WA5HPV

Dayton Hamvention

This is one of the big conventions of each year. Don't miss it. April 27, 1968 at the Wampler Arena Center, Dayton, Ohio, sponsored by the Dayton Amateur Radio Association. QSO in person at the nations foremost radio event of the year. There will be technical sessions, exhibits, hidden transmitter hunts, and an outstanding program for the wives. For further information write: Dayton Hamvention, Box 44, Dayton, Ohio 45401.

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ITV Got You Down?

Try these simple cures to beat it

Are you plagued with a peculiar "buzz saw" sound every 15 kHz on your receiver? From conversation with other hams I would guess that most of us on the low bands occasionally are. This "buzz saw", or ac modulated signal originates in the horizontal sweep circuit of television sets, and when not properly suppressed, can cause more QRM than a kilowatt next door. When your TV set is operating, an electron beam is flashed across the television screen from inside the picture tube at a rate of 15,750 sweeps per second, creating a harmonically rich 15.75 kHz ac modulated signal. This mess is then either carried over the ac power line, radiated from the TV antenna, or radiated through the back of the television set's cabinet. In accordance with F.C.C. part 15 regulations, manufacturers are supposed to suppress this signal, but often because of cost cutting, very little suppression is actually accomplished. So, as in electrical interference and TVI, the responsibility for curing this is left to the radio amateurs. How do you cure it? This article was written to show you how. There are several suppression steps which can be taken, each progressively more drastic in nature. Depending on how far away the offending television receiver is, you may have to take any number of suppression steps.

Line radiation

The first and most common means of radiation of the horizontal sweep circuit signal is through the power lines. To suppress this, the best method is to bypass the line cord with capacitors. Take two .01 mfd. disk ceramic capacitors with a rating of at least 150 volts each, and solder them between each side of the ac line and the television set chassis at the point of entry or interlock. This should cure at least some of the interference, and if the set is several houses away from your rig, this may provide all of the suppression that you need. In both of the TV sets suppressed by WA7BGO and me, the bypassing had already been done by the manufacturer of the sets. However, if yours is an older model, this probably has not yet been done. If you are still receiving the 'buzz saw" signal after this step, read further.

TV antenna radiation

As with the ac line, stray coupling may exist between the horizontal sweep circuit and the television antenna system. To cure this, a high pass filter should be installed. There is no need to buy one. Just write to the manufacturer of the offending television receiver explaining the problem, and they will gladly furnish you with a brand new Drake filter absolutely free of charge. When you connect the filter, be sure to install it inside the television cabinet to minimize radiation. With this you are killing two birds with one stone; minimizing ITV and TVI. If this step does not completely wipe out the harmonics, the next "block buster" step is guaranteed to cure the most severe cases of ITV.

Direct radiation from the horizontal sweep circuits

Radiation may escape through the television cabinet and be radiated quite a distance. The obvious solution is to shield the cabinet. I taped sheets of aluminum foil to the inside of the TV cabinet until it was almost completely shielded (there were some inaccessable spots). Then in several places the shielding was grounded to the chassis of the set. Radiation out of the front of the set is almost nil as TV picture tubes are coated on the back with a metalic paint that effectively shields the front of the set.

You May Have A Deduction Coming On Taxes

If you operate MARS, that is. Read on, tnx to WB6AEO who pointed this out in the Internal Revenue Bulletin for 23 October 1967:

"Unreimbursed out-of-pocket expenses incurred by the taxpayer, a civilian "ham" operator, in operating his radio equipment as a volunteer member of the supplemental program of the Military Affiliate Radio System (MARS), an organization of military radio stations and facilities established at United States Army and Air Force installations, are contributions or gifts within the meaning of section 170(c) (1) of the Internal Revenue Code of 1954 and are deductible subject to the limitations set forth in section 170(b)(1)(B) of the code."

Further, ". . . a deduction shall be allowed for any charitable contribution . . . subject to certain limitations." And ". . . the Code defines "charitable contribution" as including a contribution or gift to or for the use of a State, a Territory, a possession of the United States, or any political subdivision of any of the foregoing, or the United States or the District of Columbia, but only if the contribution or gift is made for exclusively public purposes." And ". . . no deduction is allowable for a contribution of services. However, unreimbursed expenditures made incident to the rendition of services to an organization contributions to which are deductible may constitute a deductible contribution." And the kicker: ". . . the nonreimbursed out-of-pocket expenses incurred by the taxpayer for the operation, maintenance, and repair of his radio equipment which are directly attributable to the performance of such voluntary services are deductible. No deduction is allowed for . . . a proportionate share of the general maintenance or repair . . . or for the fair rental value . . . or for the depreciation occasioned by such use . . ."

So there you have it, lads. It appears to the Editor (though the IRS may not agree) that this same reasoning would apply to expenses incurred in any PUBLIC SERVICE type of operation such as AREC, RACES, etc.

Reprinted from The Footprint, the bulletin of the Foothill Amateur Radio Society, Palo Alto, California, edited by Jim Lomasney WA6NIL.

After the taping of the aluminum foil to the inside of my family's small portable, and a large cabinet type at WA7BGO's house, we were unable to find any trace of the buzz saw signal on either of our station's receivers.

The only real difficulty encountered was trying to convince my parents that the TV was radiating illegally and that I had to tear into it. A call to the local FCC office revealed that a standard FCC letter will be sent out on request, explaining ITV and the FCC's position to the TV owner, should any difficulty with the owner arise.

In conclusion, this project has been most enlightening in the area of ITV and has improved communications at WA7BGO and WA7CSK tremendously.

. . . WA7CSK

(*Ed. note*: *Use caution with foil shielding as complete blocking of air circulation leads to excessive heat and may ruin a transformer or other component*).

FM EQUIPMENT

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140-D, 50 watt output, 12 volt input, dynamotor supply 65.00
30-D, 30 watt output, 6 volt input, dynamotor supply Xmtr only 5.00

High Band 152 to 162 megacycles

T-33AAT, 8-10 watts output, transistorized receiver, 6 volt transistor power supply 35.00
Mounting bracket for above 5.00
80-D, 30 watt output, 12 volt input, dynamotor supply, sensicon rec. 65.00
30-D, receiver only, 110 volts AC power supply 35.00
30-D, Xmtr-Rec. with cables, 110 Volts AC power supply 65.00

450 megacycles

T-44AAV, 18 watts output, 6/12 volt input, vibrator power supply 60.00

Miscellaneous

P-8115 power supplies, brand new, 180 volts @ 60 ma, 6 volt input, add a 5 ohm 10 watt resistor to convert for 12 volt use 8.00
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All equipment is used and in fair to good condition. All sales must be for amateur use, no commercial uses please.

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Helen Sessions WA6SPT
4861 Ramona Place
Ontario, California 91761

The YF Fights Back

Most husbands, I've been led to believe, are considerate enough, but that OM of mine most certainly never was! He turned into one of those Ham "Monsters" and began to forget to kiss me when he came home from work. He never asked me how my day went, or how the children were. He would just rush in the door, and make a bee-line for that trash-pile he calls a radio shack. He would lock all his doors, throw a bunch of switches, and fill his ears with wild, nerve wracking screetches.

I remember one particular day when he came home and followed the above procedure. I had dinner ready, and it was all set to put on the table, so I sat down and began to figure a way to get him to come out to eat. Just for laughs, I thought I would try calling him for a change.

"Dinner's ready, Darling" I casually sang. I cocked my ears to hear through all the QRM in the shack, and presently the locks moved and the door swung open. To my utter amazement, the OM burst forth.

"Have you seen my soldering gun?" he asked innocently. Looking past me, he spotted the gun on the chair by the table. He darted forward, snatched the iron, and disappeared back into his hole before I could protest.

"Your dinner is getting cold, Baby Doll", I called sweetly. He answered by turning up the receiver gain full blast. I began to get a little shook.

"K6–!, here is your XYL calling and sitting by!" I stuck my ear to the door to see if he copied.

"Sorry, OM," he was saying politely, "Little QRM on you that time. Better give me that again."

A trifle irritated at this point, I went into the kitchen and returned with a hammer. Being a little familiar with the code, I very lightly tapped out "CHOW" on the shack door, splintering the panel. I listened.

"Can't copy, OM . . . some lid is sending CW on ur frequency."

Still undaunted, I retreated to reorganize my attack. Deciding on a new offense, I grabbed the scissors from the sewing machine drawer, and zipped out the back door. His transmission line was no problem at all for my pinking shears and it gave easily after two snips. Smiling coyly at my genius, I raced back into the house to see my results. After hiding the shears, I waited at the dining room table. He would be sauntering out in no time, I calculated. I waited a few minutes, but still no sign of the beast from 50 million cycles. I snuck up next to his door again, and put my ear to the keyhole.

"I was in QSO with a guy down on forty a few minutes ago," he was saying, "but the band folded suddenly, so here I am on six.

To heck with dinner. I got myself a ticket and now have a rig sitting where the dining room table used to be. Once in a while I have a QSO with the OM. He's not such a bad guy once you get to know him. He does have his faults, though. It seems he always wants dinner when the skip is in.

. . . WA6SPT

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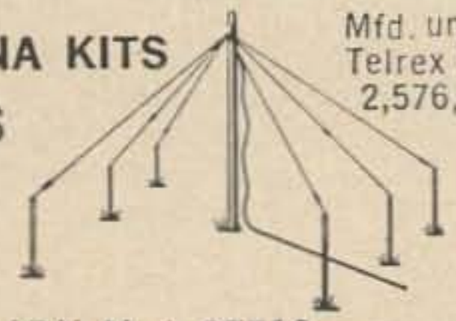

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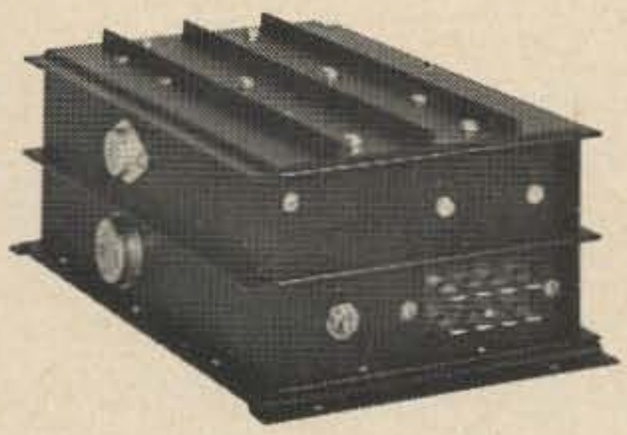
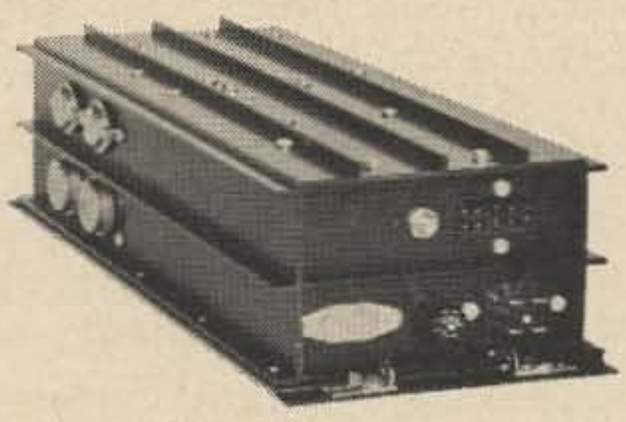


CENTURY Model 400-12 and 500-12 . . . long-time favorites of amateurs everywhere. Both models operate all transceivers, but the 500-12 gives your rig that extra power when conditions get rough or the battery low. 400-12: $129.50. 500-12: $149.50. At dealers everywhere!

CENTURY CABLING INFORMATION

CENTURY 400-12 Pin # Wire Size	CENTURY 500-12 Cables	FUNCTION	SW 350 SW 500	SW 240	SW 400	TR-3 TR-4	NC-200 NCX-3 NCX-5	KWM-1	KWM-2	SR 400 SR 160 SR 500	GALAXY 300	GALAXY III V
1 & 2	#8 Red	12v Battery										
3 #22	#22 Yellow	Bias	3	3	3	9	3	4	4	4	9	9
4 #22	#22 Green	Low Voltage	10	10	10	11	9	1	1	2	3	3
5 #22	#22 Red	High Voltage	8	8	8	10	11	2	2	1	1	1
6 #22	#22 Black	Starter	1	7	7	2	1	7	5	5	4	12
7 #8	#8 Brown #16 Black	Ground —12v Battery	2 & 6	6 & 9	6 & 9	1 & 6 & 7	2 & 5 & 6	3 & 9 & 10	3 & 7 & 10	3 & 6	10 & 11	7 & 11
8 #16	#16 White	12v Filament	4 & 5	N/C	N/C	4	4	12	11	7	5 & 6	5 & 6
Inter-connect					2 & 4 & 5							
Ext. Spkr. to Ground			12	12		12	7				12	
12 Volts to Switch				2	1							

COMMANDER Model 400-12/117 . . . for all commercial transceivers up to 500 watts PEP. Operates from 117 volts ac, 50 - 400 Hz, or 12 - 15 volts dc! Multiple high- and low-voltage output taps including adjustable bias and battery charging voltage. Compatible with transceivers for years to come. $189.50.



COMMANDER CABLING INFORMATION

COMMANDER Pin # and Wire Color	FUNCTION	SW 350 SW 500	SW 240 SW 400	TR-3 TR-4	NC-200 NCX-3 NCX-5	KWM-1	KWM-2	SR 160 SR 400 SR 500	GALAXY 300	GALAXY III V
1 Green	+275 Volts	10	9	11	9	1	1	2	3	3
2 Red	+800 Volts	8	8	10	11	2	2	1	1	1
3 Black	Ground									
4 Yellow	Bias - 0 - 125 Volts	3	3	9	3	4	4	4	9	9
5 White	Switch	1	1	1	1	7	5	5	4	12
7 Purple	Switch	2	2	2	2	9	7	6	11	11
8 Orange	+12 Volts	5	5	N/C	N/C	N/C	N/C	N/C	5	5
9 Blue Brown	12 Volts A.C.	4	4	4	4	12	11	7	6	6
10 Black	Ground	6	6	6	5 & 6	3, 10, 14	3 & 10	3 & 9	10	7
	Ext Speaker	12	12	12	7					12
14 - 16 Red	+12 Volts	Battery	D.C. Input Cable							
13 - 15	—12 Volts	Battery	D.C. Input Cable							

LINEAR SYSTEMS, INC.

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Sam Kelly W6JTT
12811 Owen Street
Garden Grove, California 92641

A Career in Electronic Engineering

If electronics has captured your interest long enough for you to get a ham ticket, you have probably thought about Electronic Engineering as a career. If so you have undoubtedly run into a lot of contradictory information. On one hand you read about the major layoff's in the "Aerospace" industries, a decline in the enrollment at engineering colleges, and government statements about the "surplus" of engineers. On the other hand, the current Los Angeles Times Sunday edition—which is a barometer of the engineering profession—is bulging with help wanted ads for Electronics Engineers. Many of the trade magazines carry editorials on the shortage of skilled engineers.

Which story is correct? Is there a demand for engineers? If so, is the demand here to stay? How do I prepare for a career in Electronics Engineering? Will I find it challenging and financially rewarding? These are some of the questions you have probably asked yourself.

Currently there are about 260,000 graduate engineers of all types active in the aerospace and electronic industries. About 90% of these entered the profession since World War II. A majority of these are veterans who went through school on the GI bill. The World war II group (which has set outstanding scholastic and engineering records) is now in the 40 to 50 year bracket. They are entering middle management and corporate executive positions. The Korean war group is at the Senior Engineer and Project Manager level. This leaves a shortage of engineers in the 1-10 year experience level. This shortage is becoming more acute because of a decline in engineering enrollment.

The shortage of engineers with rf backgrounds is even more critical. For the past decade the educational emphasis has been on digital computers and digital techniques. Suddenly, industry is realizing that there are very few qualified rf engineers. The required shift of all telemetry activity from the 215-260 MHz band to the 2.2-2.3 GHz band by 1970 has precipitated a crisis in many programs. Challenging programs like the POLARIS S-band conversion and POSEIDON are seriously short of engineers with experience in all phases of rf design, and no doubt will remain so for many years. The satellite communications system (both commercial and military), and commercial television also need rf engineers. If you enjoy working with rf the future is very bright.

A wide range of engineering skills went into this portable telemetry station. This system recovers telemetry data from POLARIS missiles and has facilities for tracking the missile and destroying it if it goes off course.

Educational Requirements

Before World War II an ambitious self educated man could crack the engineering profession. Now the table stakes are much higher. It requires a minimum of a Bachelor of Science degree with the Master of Science degree becoming increasingly important. In fact, some colleges report that as much as 30% of their graduating students go directly into graduate study.

With this trend to graduate education we can logically expect that in 10 years the average engineer without a Masters de-

gree will find his opportunities severely limited. Even now a high percentage of employment advertisments read "Engineer wanted MS preferred". This means that to provide yourself with the best training and background to maximize your career opportunities you should plan on five years of college. This is expensive, but don't get discouraged. Where there is a will there is a way—in fact, several, ways.

Earlier I mentioned that the majority of Engineers were veterans. Most of us realize that to maintain our free society every citizen has a responsibility to serve in our armed forces. By careful planning you can receive valuable training that may be used for college credit, and qualify for the GI bill which will pay for your formal education when you get out. All of the services have good electronic schools. However, the Navy schools seem to have the edge on technical excellence. Many service courses are accepted for lower division credit at engineering colleges. It is advisable to discuss your plans with a counselor at the college of your choice prior to enlisting.

There are numerous other sources of financial aid available to the engineering student. These range from scholarships, outright grants, federal student loans to work aid programs at the colleges. Your best help in locating funding is your local public librarian. Also check the scholarship section of the college catalogs and talk to your teachers.

Types of Engineering Schools

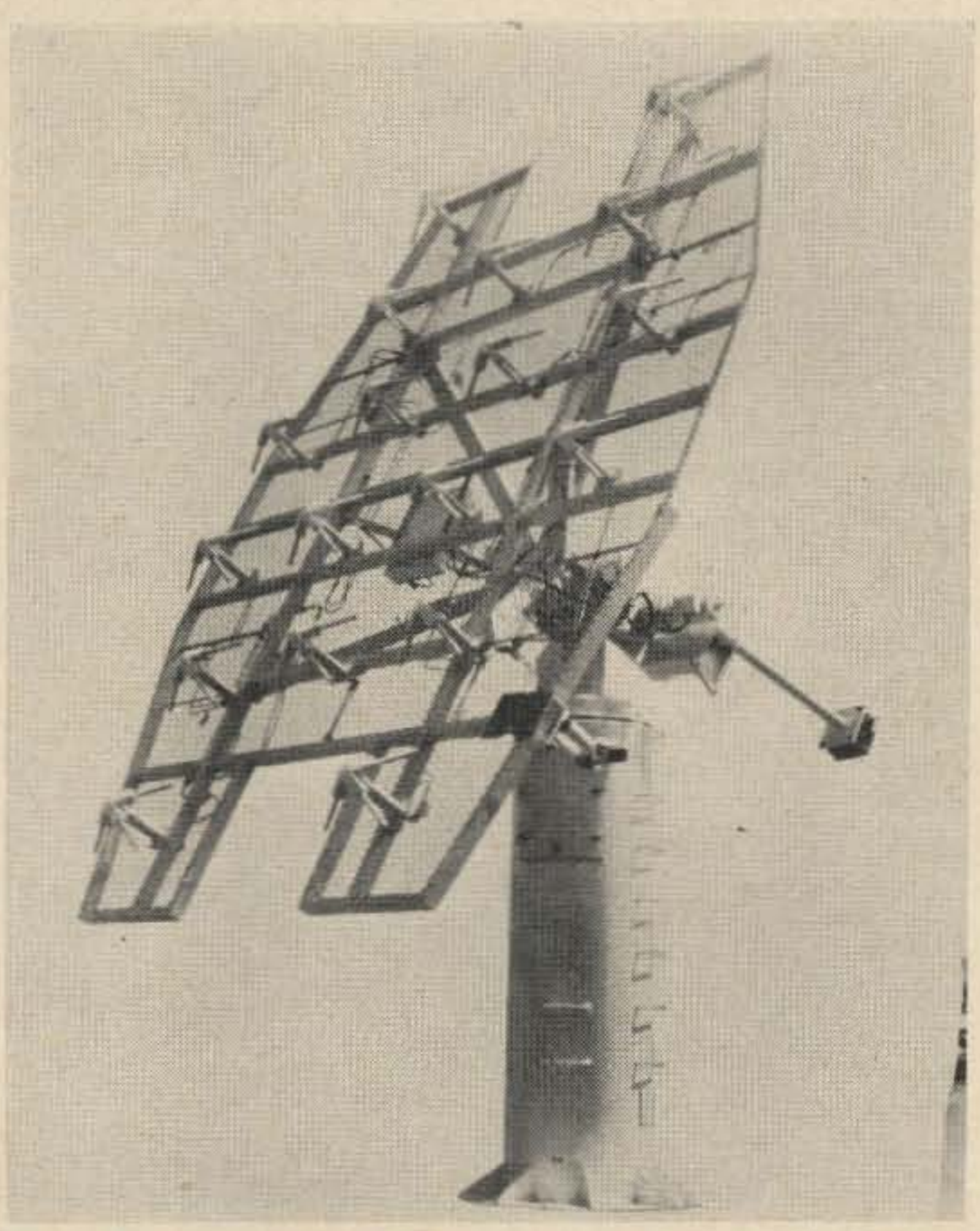
There are two basic approaches to engineering education in the United States. If you are certain that you are interested in Electronics, the Polytechnic college may be your best bet. Schools like California State Polytechnic College start right off with electronics courses in the freshman year. The conventional schools concentrate the general courses in the freshman and sophomore years and the electronics courses in the junior and senior years. Get catalogs from several schools of each type and compare the curriculum before deciding.

Compensation

Will engineering pay a good salary? The February 1967 graduating class averaged about $668 per month in starting salaries. The average for Southern California research and development oriented companies was about $734. You can reasonably expect to double your starting salary in 10 to 12 years.

As with any career, salary is only part of the compensation, and not the most important! Engineering can be as exciting as you want to make it.

.....W6JTT



This Canoga TELTRAC system automatically tracks missiles with telemetry signals in the 215-265 MHz band. It was used to track the project GEMINI capsule. Systems of this nature require skills in the rf and servomechanisms fields.

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What is YOUR "Amateur Q"?

Listen to the various bands and what do you hear? You hear "authorities" of all degrees and kind on any subject that you might suggest; you hear some very interesting technical talk; you hear amateurs giving of their time and talent to the handling of overseas' phone patches for our servicemen; you hear some boasting of DX worked, high efficiencies of linear amplifiers, very high forward gain and front-to-back ratios for beams, etc., ad infinitum. Unfortunately there is also a lot of idle chatter that does not fall within the Amateur Code and much operational procedure that does not fall within the FCC RULES AND REGULATIONS, PART 97, AMATURE RADIO SERVICE. Let me quote from SUBPART A, General, 97.1, Basis and Purpose," . . . an amateur service having a fundamental purpose expressed in the following principles:

a. Recognition and enhancement of the value of the amateur service to the public as a voluntary non-commercial communication service, particularly with respect to providing emergency communications.

b. Continuation and extension of the amateur's proven ability to contribute to the advancement of the radio art.

c. Encouragement and improvement of the amateur radio service through rules which provide for advancing skills in both the communication and technical phases of the art.

d. Expansion of the existing reservoir within the amateur service of trained operators, technicians and electronics experts.

e. Continuation and extension of the amateur's unique ability to enhance international good will."

THIS IS OUR CHARTER FOR EXISTENCE! How do you think WE as amateurs accomplish what is intended in the above listed principles! I'm not sure, AND I'm not going to judge the amateur fraternity as a whole on the basis of the actions of a few. What's more, although I have very definite interests within the scope of the enjoyment of amateur radio, I feel that each amateur has the right, within the laws, to pursue those interests which provide him the most enjoyment and satisfaction, such as CW, SSB, AM, VHF, TRAFFIC, etc.

What I would like to do in this article is to provide some thought provoking material which I hope will in some small way improve amateur radio and at the same time make us more respectful of the liabilities which we accept when we obtain a license from the FCC.

How many of us have an up-to-date copy of the FCC Rules and Regulations, Volume VI (October 1966), in which PART 97-Amateur Radio Service, is included? I'll bet a good percentage have never seen one? I'll also bet that most are using the appendix to the License Handbook, and, an old e d i t i o n at that. There have been changes in the laws under which we operate over the past few years, not very large changes but changes which affect us. On what do you rely for the latest information on changes in the laws? How can you comply if you are not knowledgeable about the laws?

I had these thoughts in mind recently as I was reading PART 97 when an old tried, true and familiar equation came to mind–"Q = X / R"; one with which we should all associate the word *MERIT*. I would like to use this equation, but with a slightly different interpretation, to establish not a figure of merit for an inductor based upon the relationship of its reactance to its resistance, but an AMATEUR Q (amateur figure of merit) based upon the relationship of our compliance (or positive reactance) with the laws to our resistance (or non-compliance) to the laws. Therefore, my equation reads as follows:

$$Q = \frac{X}{R} = \text{Amateur "Q"} = \frac{\text{Compliance with the laws}}{\text{Resistance to the laws}}$$

Where

Compliance means "being knowledgeable about the laws and making an honest effort to comply with them".

Resistance means "not knowing the laws and making little or no effort to comply with those which require a small degree of difficulty or time consuming energy".

Now that I have defined the terms in my equation, how will we use this equation? SUBPARTS C, D, and E, Chapter 97, Volume VI, FCC Rules and Regulations contain the laws pertaining to "Technical Standards", "Operating Requirements and Procedures" and "Prohibited Practices and Administrative Sanctions" respectively. Each paragraph in these SUBPARTS details laws governing our operation of an amateur station. Later in the article I have posed some questions on each paragraph which should stimulate some thought about how well we *comply with* or *resist* the laws. In order to develop some numbers which can be inserted in my interpretation of the figure of merit equation, I have arbitrarily assigned a point value of "10" to each paragraph since I was not able to "weight" each in terms of its importance (each is a part of the total law). Below I have provided a "Q-Card" for you to tally the evaluation of your "compliance" and "resistance". Columns "X" and "R" are provided for these tallies respectively. Now, after you have read the question(s) for each paragraph, analyze your operations in terms of "compliance" and "resistance", and then assign values to "X" and "R", being mindful of the fact that the sum of the X and R values must equal 10. For example, if you feel that you fully comply with the law, then you would enter 10 under X and O under R; 70% compliance would result in entries of 7 under X and 3 under R; complete failure to comply would be entered as O under X and 10 under R.

SOOoooo—now proceed to the questions—do some soul-searching—BE HONEST AND FORTH-RIGHT! You won't be kidding anyone but yourself if you don't sit back and really think about your operations in terms of the law.

"Q-CARD"

Paragraph	Point Value	Amateur Q "X"	"R"
97.61	10		
97.63	10		
97.65	10		
97.67	10		
97.69	10		
97.71	10		
97.73	10		
97.75	10		
97.77	10		
97.79	10		
97.87	10		
97.97	10		
97.99	10		
97.103	10		
97.105	10		
97.111	10		
97.113	10		
97.115	10		
97.117	10		
97.119	10		
97.121	10		
97.123	10		
97.125	10		
97.129	10		

FCC Rules and Regulations
Subpart C: Technical Standards

97.61: Authorized Frequencies and Types of Emission.

a. Are you familiar with the limitations, both frequency and type of emission, in the band, and/or bands, in which you operate?

b. Have you gone outside the band to work on elusive DX station?

97.63: Individual Frequency Not Assigned.

a. Since you are not assigned a given frequency, how gentlemanly are you when someone "zeros-in" in on the frequency you are using?

b. How well do you avoid "Net frequencies", particularly those whose mission accomplishes a really worthwhile purpose such as the "Eye Bank Net", and many, many others?

97.65: Special Emission Limitations.

a. How do you determine the bandwidth of your signals for the various types of emission that you might use?

b. Is your test equipment adequate for the purpose?

97.67: Maximum Authorized Power.

a. Maximum DC power input to the final amplifier stage of an oscillator-amplifier transmitter or to the plate circuit of an oscillator transmitter is one kilowatt (1 KW). This paragraph also states that input power in excess of 900 watts must be accurately measured. Can you comply with this requirement with your present transmitter? Remember that Power is the product of Voltage and Current!

b. The term "accurately" is used in connection with this measurement of DC Power. Do you know the accuracy of your meters, shunts and multipliers used to measure your power?

e. If you operate on those bands where the power limitations are much lower, how do you measure the power?

97.69: Radio Teleprinter Transmissions.

a. How do you determine that your speed is 60 ±5 words per minute?

b. For F1 emission the deviation in frequency from mark to space, or vice versa, shall be less than 900 cycles per second (hertz). How do you measure this?

c. For A2 and/or F2 emission, the highest modulating frequency shall not exceed 3000 cycles per second (hertz) and the deviation between the mark and space signals, or vice versa, shall be less than 900 cycles per second (hertz). What equipment do you have that will insure this?

97.71: Transmitter Power Supply.

a. What methods have you employed to insure that the ripple voltage from your power supply is not modulating your signal? Can you measure it?

97.73: Purity and Stability of Emissions.

a. How do you determine 100% modulation of an A2 or an A3 emission?

b. How do you determine that your SSB transmitter is delivering a "clean signal"?

c. How do you determine that you have spurious radiations, such as harmonics, subharmonics, spurious modulation products, key clicks, parasitic oscillations, and/or other transient effects?

d. How do you respond to a fellow amateur who tells you that you have a poor signal (or some problem)? Do you try to convince him that his receiver is no good or do you try to find out what the trouble is and make some checks with him?

e. Do you have a dummy load for testing purposes?

97.75: Frequency Measurement and Regular Check.

a. How do you determine the output frequency of your transmitter?

b. Can you check the frequency calibration of your receiver?

c. Do you feel that the accuracy designed and built into the equipment by the manufacturer is satisfactory for this requirement?

d. How long since you have checked your "100 KC Calibrator" against a standard frequency transmission from the National Bureau of Standards (or some other known standard of frequency of comparable accuracy)?

Subpart D: Operating Requirements and Procedures

97.77: Practices to be observed by ALL Licensees.

a. Each amateur station shall be operated in accordance with good engineering and good amateur practice. How good is your engineering practice? Do you have test equipment with which to measure or at least "monitor" your construction or installation work?

b. How well do you practice the "Amateur Code"?

97.79: Who may operate an Amateur Station?

a. The licensee of an amateur station may allow a non-amateur to speak over a microphone or to operate a teleprinter as long as the amateur turns the carrier on and off and signs the station off after communication with each station has been completed. Do you allow a non-amateur friend to speak into a microphone that operates a VOX circuit?

b. Does your teleprinter keyboard turn the transmitter on and off? If so, your friend should not operate the teleprinter according to the law.

c. Do you let Novices or Technicians operate your station?

97.87: Transmission of Call Signs.

a. Do you identify your station at the beginning and end of each single transmission?

b. Or, at the beginning and end of a series of transmissions, each transmission of which is less than three minutes?

c. And, at least once every ten minutes, or as soon thereafter as possible, during a series of transmission between stations having established communications?

d. And, at least once every ten minutes during any single transmission of more than ten minutes duration? NOTE: You should read this paragraph in the Regulations in its entirety; it's amazing, informative and interesting.

97.97: Notice of Operation Away From Authorized Location.

a. If you intend to operate "portable" for a period of more than 48 hours, do you provide proper notification to the Commission? (Portable in excess of 48 hours means that you do not return to your fixed transmitter location before 48 hours have elapsed.)

b. When you have moved, have you filed notice of "Portable Operation"?

97.99: Special Requirements for Nonportable Stations.

a. Have you applied for a modified license within four months of your move to a new home?

97.103: Station Log Requirements.

a. Do your logs include:

1. Date and time of each transmission.
2. Signatures of licensed operators who have operated your station.
3. Signatures of non-licensed persons who speak over your station.
4. Call sign of station called.
5. Time of signing off with a given station.
6. Input power.
7. Frequency band used.
8. Type of emission.
9. Location of station, particularly when mobile.
10. Message traffic handled.

97.105: Retention of logs.

a. Logs must be retained for one year from the date of last entry. Do you have your last log, if the date of the last entry is less than a year ago?

Subpart E: Prohibited Practices and Administrative Sanctions

97.111: No Remuneration for Use of Station.

a. Have you accepted material compensation, direct or indirect, paid or promised, for the use of your station? (Curiously: I wonder how "donating" to a DX-pedition, or accepting donations by a DX-peditioner, is evaluated in terms of the Law?)

97.113: Broadcasting Prohibited.

a. Broadcasting is defined as the dissemination of radio communications intended to be received by the public directly or by the intermediary of relay stations, or the retransmissions by automatic means of programs or signals emanating from any class of station other than amateur? Are you guilty?

97.115: Music Prohibited.

a. Have you transmitted music over your station, either directly or possibly from the background?

97.117: Codes and Ciphers.

a. Have you used any form of coding or ciphering, other than commonly used abbreviations?

97.119: Obscenity, Indecency, Profanity.

a. Has the speech in your transmissions been "clean and pure" even though disturbed by poor operating practice on the part of another?

97.121: False Signals.

a. Have you used the call letters of a station not licensed to yourself?

97.123: Unidentified Communications.

a. Have you properly identified your transmissions?

97.125: Interference.

a. Have you wilfully or maliciously caused interference to any radio communication or signal? (Like tuning up on the fellow whose operating practices you don't appreciate.)

97.129: Fraudulent Licenses.

a. Have you taken the examination for a license for another, or vice versa, has someone taken the examination for you?

b. Have you been diligent in giving examinations to applicants for Novice Class Licenses?

Now that you have read all the questions and are satisfied with your assignment of points, add up columns "X" and "R" and substitute them in the following equation.:

$$\text{Amateur Q} = \frac{X}{R} = \text{———} =$$

HOW DID YOU RATE YOURSELF AS A LAW ABIDING AMATEUR? Well, since I arbitrarily assigned the value of 10 points to each paragraph, and, you honestly (?) evaluated yourself—well—who really cares? We all should! It is our image, our public image, that will determine our future. For example, recent publicity resulting from newspaper, radio and TV coverage of the "mean ham" tarnished our image very much, even though at the same time there were many, many amateurs who were living by the Amateur Code and within the Basis and Purpose outlined in Paragraph 97.1. Anyhow, how does your "Q" stack up with the following:

Q	REMARKS
0- 3.0	You're licensed?
3.1- 5.5	Try harder!
5.6-10.0	You're GOOD!
10.1-25.0	EXCELLENT!
25.1-114	I said "BE HONEST"!
∞	You MUST be KIDDING!

If I haven't done anything more than make you more cognizant of the laws which regulate our wonderful hobby then my efforts will not have been in vain. I would recommend that you spend $1.25 for a subscription to VOLUME VI of the FCC Rules and Regulations, which covers PARTS 95, Citizens Radio Service, 97, Amateur Raddio Service, and 99, Disaster Communications Service. It is available from the Superintendent of Documents, Government Printing Office, Washington, D. C., 20402. You will then be able to have the law in front of you and will not have to rely on some "joker" whose "Q" is above 239,—scored of, by and for himself.

. . . K3STU

YOUR CALL

Please check your address label and make sure that it is correct. In cases where no call letters has been furnished we have had to make one up. If you find that your label has an EE3*&* on it that means we don't know your call and would appreciate having it.

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Note: All items are brand new except vidicons which we guarantee will work with the parts kit supplied when assembled according to the schematic and adjusted according to normal procedure. Since step-by-step instructions are not available, we recommend this kit only to those who can follow a schematic.

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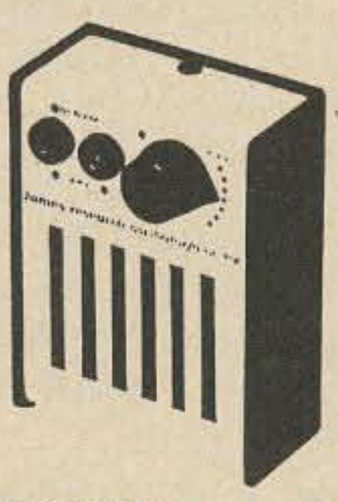
"Mother Shipton's" prophecy has been handed down, so it is claimed, just as it was originally written, and if that is so it is certainly a most remarkable document to read in these days of electrical and electronic marvels. Here it is;

Carriages without horses shall go,
And accidents fill the world with woe.
Around the world thoughts shall fly
In the twinkling of an eye.
Waters shall more wonders do.
Things now strange shall yet be true.
The world upside down shall be,
and gold be found at the foot of a tree.
Through hills man shall ride,
And no horse or ass be at his side.
Under water man shall walk,
Shall ride, shall sleep, shall talk.
In the air men shall be seen,
In white, in black, in green.
Iron in the water shall float
As easy as a wooden boat;
Gold shall be found and shown,
In a land that's not now known.
Fire and water shall wonder do,
England shall at last admit a Jew.
The world to an end shall come
In eighteen hundred and eighty-one.

This ode copied from the January 1, 1928 issue of *Telegraph and Telephone Age*.

. . . K4FQU

oscillator/monitor



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Recovering "Lost" QSLs

Have you ever wondered where all those QSL's are that the guys said they sent but you never received? Undoubtedly many of us at one time or another forgot to send the QSL we promised for one reason or another, but for those that were actually sent and not received read on.

Let me explain how you and your club might rescue some of those hundreds of QSL cards that are misaddressed, unforwardable or otherwise unable to be delivered by the U.S. Post Office each year.

Typically, those hundreds of QSL cards we just discussed are sent to the "Dead Letter Office" and are burned! What you say, first class mail being burned and not returned? Yes, that is right. Here in California the "the dead letter office" is in San Francisco. Can you imagine all those QSL's from that last state for W.A.S. on six meters, the rare one on 20 SSB, the Saudi Arabia station on 80 meters the gang didn't believe, all going up in smoke? Kinda hard to take isn't it. Well thats the way it is. To quote a few verses from the U.S. Postal Manual,[1] " . . . other mail including first class and Air bearing no return address is sent to a dead letter office or branch for final disposition." What determines if it is "Dead Mail"? Well, dead mail is defined as ". . . matter deposited in the mail which is or becomes undeliverable and which cannot be returned to the sender. First class is forwarded on fixed schedule to dead letter post branches from local offices", additionally, "dead mail that cannot be delivered to the addressee or sender is destroyed or sold".

Now that the problem has been pointed out, I think we can begin to offer solutions for saving those valuable QSL's. The most logical beginning is the sender of those lost cards. How does he send the QSL more informatively? As a start, address the card to WC6AAA, J. H. Ham. In bolder terms, include WC6AAA's name. This is quite important as J. H. Ham may have moved and WC6AAA may not mean a thing to the local postman.

In order to expedite mail, the Post Office has instituted many programs including ABCD, VIM, ZIP, NIMS, and POMSIP. Most of these resemble the CW abbreviations we use however mean less to you and I as amateurs. Of importance here though is the ZIP code we are fairly familiar with. As much as possible, use the other fellows zip code number in the addressing of his QSL. This helps the post office handle your mail more readily. Admittedly many of our fraternity do not even know their own zip code number and it would help considerably if they contacted their local post office found out what it is and included it in their return address.

If you are inaccurate in the town's spelling or even street spelling, you suffer no great handicap. The ZIP code is somewhat forgiving. It gives the area of the U.S. (including Alaska and Hawaii), the sectional centers and individual streets in the town. If you have money to burn, a "National Zip Code Directory", POD publication #65 is available through the Superintendent of Documents[2] for seven dollars. It lists all Zip numbers for all of the continental U.S. plus Puerto Rico, Alaska and Hawaii.

While speaking about addresses, be sure your return address is on the same side of the card as the stamp. This is also particularily applicable for club bulletins mailings. To quote a few more verses,[3] " . . . only postal and post cards that bear the senders address and request for return are returned . ." also "The return address of the sender must be shown on the *address* side of the mail to secure its return." and finally, " . . . on post and postal cards, second, third and fourth class mail of no

[1] *U.S. Postal Manual, POD* 11, *Parts* 158.5, 158.7, 158.72.

[2] ZIP Code Directory DOD #65, c/o Supt. of Documents, U.S. Gov't. Printing Office, Washington, D.C. 20402.

obvious value, the sender must place RETURN REQUESTED below the return address." Another thing too, don't waste money on needless postage, the Post Office does not recover any of these monies but rather the U.S. Treasury, so you can't improve the P.O. with donations.

The final mail (QSL) solution is now presented and it is essentially the most important. This is a workable and proven solution. If you are a member of a local radio club you have a major point in your favor. This step should be taken on your club's behalf and in their name preferably. For maximum coverage it would be a good idea to bring this up to your club.

To begin with, dress in your suit or sports outfit and approach your local postmaster. Call in advance to the post office you plan to visit, find out what the postmasters name is and arrange for an appointment with him (or her). When you show up to see the postmaster, have a couple of foreign DX QSL's and maybe a local one along with one of yours to show the postmaster. Explain to him that you are an amateur radio operator, a member of Podunk Valley Radio Club and local Civil Defense unit performing public services and would like to help him in his attempt to deliver some of those undeliverable QSL's he receives periodically. Tell him some of these cards might belong to a fellow club member or someone who a member of the club knows. Impress on him that those cards are valuable to the one whom they were directed, but useless to anyone else, (a stack of your own QSL's goes good right here to show the postmaster that amateurs collect QSL's as others collect stamps, butterflies, etc.).

Since this is your first encounter with the postmaster be reassuring to him. Explain that unless the cards are in some way delivered they would be set for a plight of incineration and lost forever.

Arrange to drop by the post office periodically to see if any cards have come in. Usually the postmaster will be happy just to get rid of them and pleased to see that he is doing some good by giving them to you. Normally these cards are held in General Delivery awaiting someone to claim them. Now that you have succeeded in obtaining those undeliverable cards, make it a point to try to forward them to whoever they belong, by looking up their call in the callbook, etc.

Congratulations! You have just prospered in selling amateur radio to your own postmaster.

This program can be put into effect on a nationwide scale by you and also your radio club. Many of those lost QSL's can be showing up on a regular basis but it requires your help.

As a last comment, the future of our mailable QSL's includes possible airmail stamps of magnetic ink to quickly distinguish airmail from all other classes of mail and optical scanners for sorting mail, reading the mail (ZIP codes) bundling it and even tying the mail bags!

. . . K6UMV

PLEASE INCLUDE YOUR ZIP CODE WHEN YOU WRITE 73.

[3] et. al parts 158.21, 158.3, 158.3A.

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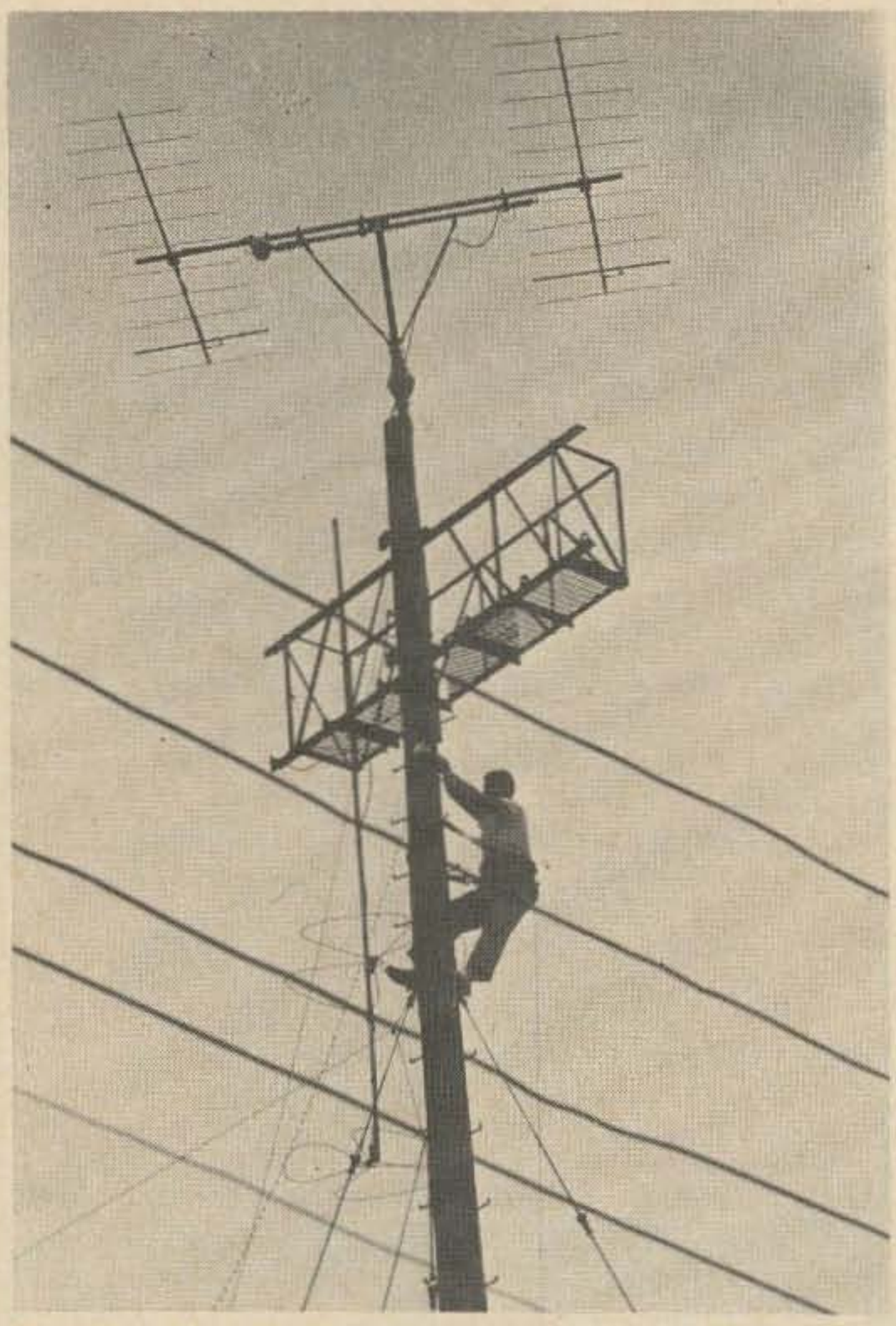
Project MOONRAY

NASTAR, the amateur radio group involved in research for outer space transmissions, has been encouraged to file a proposal for a ham transponder to be taken to the moon. Present indications are that there will be room for the package, dubbed MOONRAY, on the third LEM flight.

Since MOONRAY is an amateur project, the people at NASTAR want to get the opinion and advice of the amateur fraternity before finalizing plans for technical details of the project.

MOONRAY will be an isotope-powered package which will serve as:

1. A backup communications package for the Astronauts,
2. A site-relocation beacon to operate from the LEM landing site for one year or longer,
3. As an Amateur transponder.



Bob Fratello, WA2UBO works at the 70 ft. level on the pole holding two meter Oscar antenna and stacked 2 Meter big wheels for QST work below.

Here are some of the basic technical requirements for MOONRAY:

1. Size and weight of the complete package must not exceed five pounds and 250 cubic inches (of which 100 cubic inches and three pounds has already been allocated to the powersupply, leaving 150 cu. inches and two pounds for the electronics, antennas, etc.)

2. It must operate throughout the entire lunar months at ambient temperatures ranging from minus 250° F to plus 250° F.

3. 432 MHz has been tentatively chosen as the operating frequency since this appears to be the best compromise as far as antennas, gain vs. size, free-space losses, power requirements, Transistor noise figures and efficiencies; and a frequency where hams can still home-brew equipment with relative ease at reasonable cost.

4. MOONRAY must not interfere with or affect any of the other experiments aboard LEM.

5. Reliability, ruggedness, environmental survivability and proven performance will have to be demonstrated and satisfy NASA's Lunar experiment standards.

6. The design concepts must be such that the package can be installed on the moon by our astronauts, simply, rapidly, and with minimum effort.

7. The unit must be able to function by earth-command as a site relocation beacon for later flights.

8. The transponder must also be usable as an easy-to-operate emergency communications link for the astronauts.

9. MOONRAY must have a command shutoff and turn-on capability in addition to an overrideable one year automatic shutoff timer.

For design purposes we have available 5 watts of electrical power, and approximately 200 watts of thermal heating power. Bear in mind that the size and power limitations imposed on the Lunar package must be met with minimum complexity and must have simple plug in operation compatible with the space-suit microphone/earphone and push to talk.

VHF room with staff at work.

In order to reach a final decision, and to finalize MOONRAY specifications, we need opinions, suggestions, answers and data on the following questions:

A. What mode of operation should we use? Should it be similar to OSCAR III with all types of transmissions, or a narrow band single-frequency for CW only? Other type?

B. What operating band should we use? Should it be 432 MHz transmit and 442 MHz receive? 2 Meter transmit and 432 receive with lunar transmitter on 432 MHz? 1296 MHz transmit and 1350 receive? Any other combination of the above, or?

Antennas

Since the operating bands chosen will determine the type, size, shape, etc., of the antenna system which will be used, the method of packaging, storage, handling and unfurling will have to be considered after parameters (such as operating modes and frequencies) have been decided.

Rather than duplicating the techniques used by OSCARS 3 and 4, we hope that new design concepts submitted for MOONRAY will demonstrate a substantial advance in the state of the art. You can help design and build MOONRAY from anywhere in the world by:

1. Offering solid, technically sound suggestions on the design questions.

2. Offering to design, develop and/or construct any part of the MOONRAY hardware to the specifications decided on as a result of your suggestions.

3. Passing along the above information to fellow hams, or any other technical people, who might help get MOONRAY on the moon.

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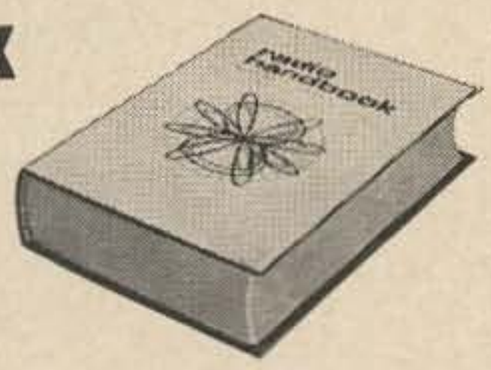

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NASTAR president, Nick Marshall at the board during a design session on the Lunar MOONRAY (Moon Amateur Relay).

Although LEM 1 is not scheduled for Moon -launch until 1970, we do not have too much time left. We must first get a firm proposal to NASA, technically sound enough to win their approval. Once approved, the first breadboard version of the design must be built and made operational. After any anomalies have been eliminated, the unit must be rigorously tested, section by section. Next the first flight model of MOONRAY is built and subjected to complete electrical and environmental tests. Then, finally, the actual package for the LEM flight can be assembled, tested, and turned over to NASA. Keep in mind that a second, "back-up" package will have to be built at the same time as the final unit. As you can see from this series of steps, 1970 looms almost too close for a project of this scope. Serious consideration of the questions above, *and prompt answers from you* are the first steps essential to getting MOONRAY on the lunar surface with LEM III. ■

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"An alert southern California experimenter has added another remarkable discovery to the long list of technical advances originally achieved in the field of amateur radio"

This is not an article concerning the operation or technical theory of amateur radio Teletype communication. The ultimate purpose of this paper will not be to advance in anyway the current developments in this field. However, since this article had its beginnings in the construction of a simple AFSK oscillator, a discussion of this simple circuit must precede our description of this new technical advancement.

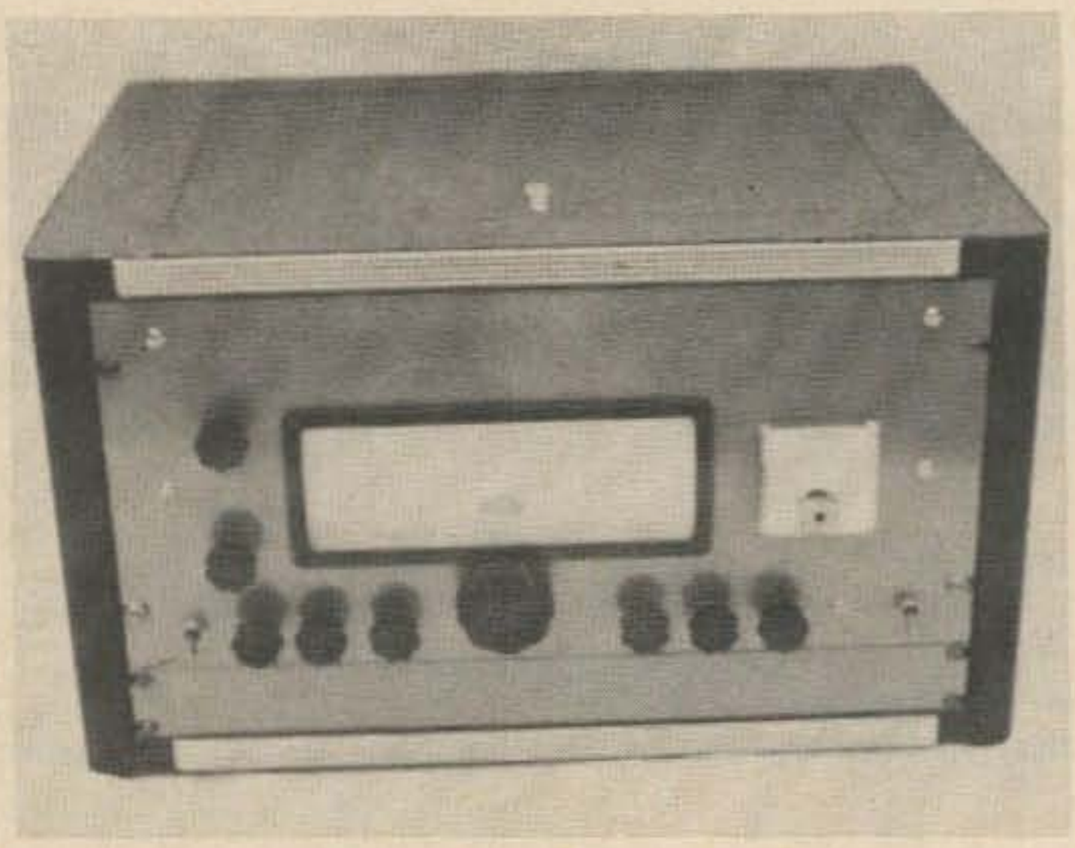
Having recently obtained a model 19 Teletype machine from the local MARS group, a W2PAT converter was soon constructed and the machine was providing excellent trouble-free operation just like the book said. Many enjoyable evenings were spent watching copy from commercial transmitters as well as twenty meter FSK and two meter AFSK. It soon became apparent that two meters had considerably more to offer than the HF bands, mostly because of the QRM on twenty and UPI was always in Spanish. After an inquiry directed to one of these AFSK operators on VHF, I soon was occupied in the construction of a simple one transistor AFSK oscillator guaranteed by all AFSK men to be the best there is. This project was completed in one morning and put into operation.

The oscillator was connected to the station transmitter directly into the microphone jack. The station receiver was used to monitor the AFSK signal from the transmitter. After connecting all the cables from the machine which was really the hardest part, the complete assembly was soon put into operation. After about three hours of "TME KUIKC BROEN FOZ KUMPED OVERA LAZY DOG%S BAAK MMM 123&56889" it soon became apparent that the printer was only giving 43.5 percent copy.

Not wishing to revert to any more experimentation, it was decided that the analytical approach was the best recourse. Being an adept engineer, the approach is obvious. For the reader unexperienced in the field of calculus, the following theoretical development may appear a bit bizarre, but let me assure you that it will be just as clear to you as to the veteran engineer or physicist. The first step is to note the inherent speed of the machine, 368 OPM, and to select a differential element of time in the basic 22 millisecond pulse duration and let this differential time element tend to zero with the pulse voltage peaks. Any engineer will tell you that this is the basic approach in differential calculus analysis. To make a long story short, we simply integrate the obtained expression over the percentage of machine copy from zero to 43.5 percent. Much to my surprise this resulted in a perfect representation of a Fourier series. Equation one shows this classical result, which is the only relation that need concern the reader.

$$f(t) = \sum_{n=0}^{\infty} a_n \cos nwt + \sum_{n=1}^{\infty} b_n \sin wt \quad (1)$$

Readers familiar with this formula will have



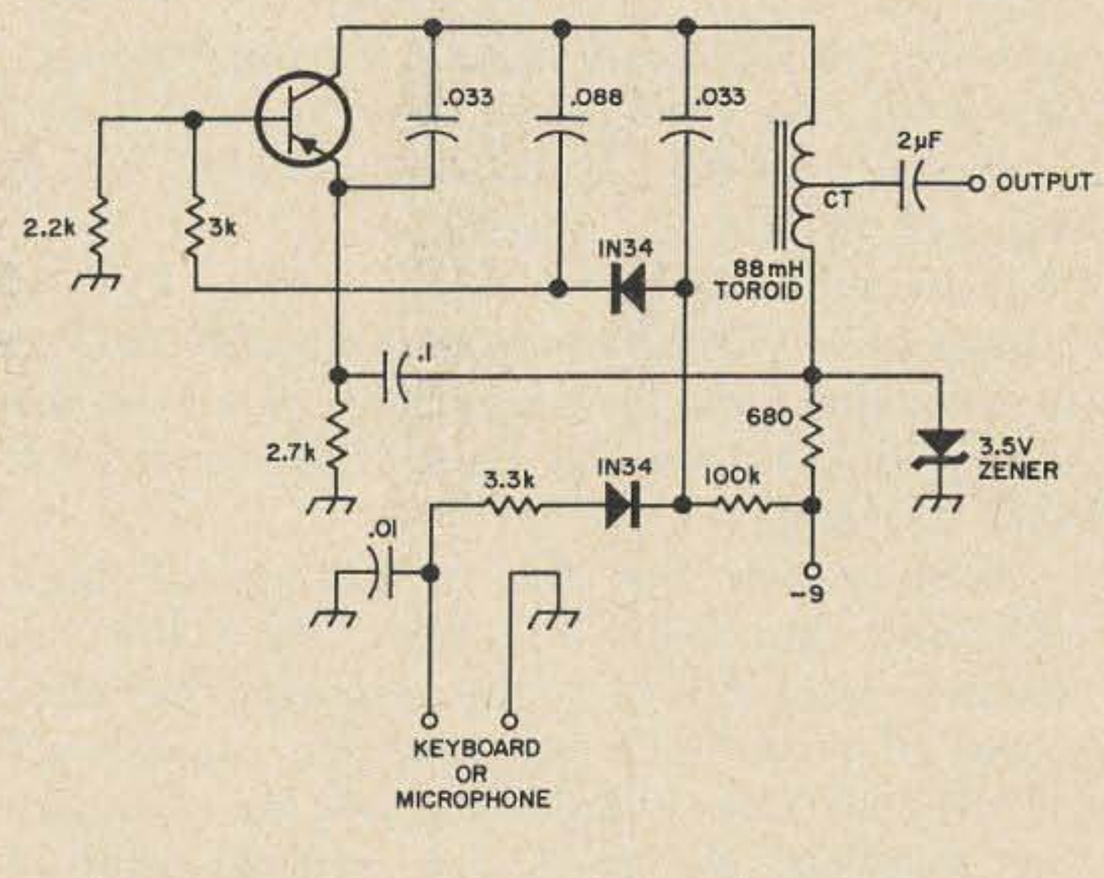
no trouble identifying the elements, and readers not familiar with its implications probably do not care, but a handy reference is given. (1) Stated simply, a Fourier series is used to represent a periodic function, and in this case, since the function is odd, the indicated series is the sine wave series. The following explanation is probably not necessary for the alert reader, but a glance at the schematic of the oscillator circuit, figure one, will soon show that the change in frequency of the oscillator is proportional to the change in resistance of the keyboard contacts. In my case since the contacts were not very clean, the change in resistance was not completely from infinity to zero. The application of a carbon microphone across the keyboard terminals on the oscillator will provide the necessary variation in resistance, and reference to the Fourier series, the proper signal to apply is the sine wave. Further experimentation showed that the applied signal could be any type of waveform, so the natural reaction was to talk into the microphone. All the rest is now history.

For the readers who have missed this development in the recent newspapers and scientific journals, the following recounting of the applications and advantages of this new mode of communications is included. This new method will be of particular interest to readers of 73 and other magazines who continually assault these magazines with their tirades on the idiocy or superiority of SSB or AM operators. There have been many problems in the development of amateur radio, but none have been so severe a threat to our organization and cooperation among ourselves as the continuous squabbling among our ranks over the use of these two modes. The unity of our fraternity has never been so close to becoming complete anarchy. The new discovery that I advocate will completely re-unite the veteran AM operators and those fools who still seem to think that SSB will someday develop into an acceptable mode of communications.

If you consider how my device produces a varying frequency audio signal corresponding to the resistance of the microphone, and how this signal is elevated above the zero audio frequency reference by the mark or space audio frequency of the AFSK oscillator, you will see that a corresponding single sideband signal with reference to audio is generated. Because of obvious reasons this new revolutionary mode will be called audio single sideband, or ASSB. The obvious advantages will allow an AM-only operator to use a mode comparable to SSB by simply plugging this unit into his microphone jack. This signal will be immediately compatible with SSB because any SSB operator will, upon hearing this Micky-Mouse sounding signal, immediately conclude that it is SSB, and a pleasant and enjoyable QSO will follow, free from the arguments and differences that have for so long made these two modes incompatible. Thus, we have a simple device that will allow any AM operator to go SSB while still retaining his AM gear, and most of his money.

In the future I expect to see much expanded use of this new mode, and it is for this reason, the unity and growth of amateur radio, that I have unselfishly decided to share my discovery with the rest of my ham brothers to whom I owe so much for the many years of enjoyable diversion that I have received in this hobby. But there is still one last unsolved problem that is still plaguing me. Does anyone know where I can find a schematic for a good AFSK oscillator?

. . . K6ICU



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(1) Fitzgerald, A. E., *Basic Electrical Engineering.* 1967 by McGraw-Hill, Inc. page 141.

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Installing a Transceiver in a Hired Car

The antenna

Nowadays it is sometimes more convenient to fly to a place rather than drive your own car there. Then you can hire a car at the destination. Installing a rig in a hired car presents a number of problems, and it is proposed to discuss these problems in the following article.

One of the first problems is installing an antenna. This must usually be done without drilling holes in the car.

There would seem to be three basic possibilities:

1. The bumper mount. This is probably the easiest but also the most inefficient.
2. There is a clamp available for mounting on the trunk lid, using the small gap between the lid and the bodywork.
3. The roof rack method.

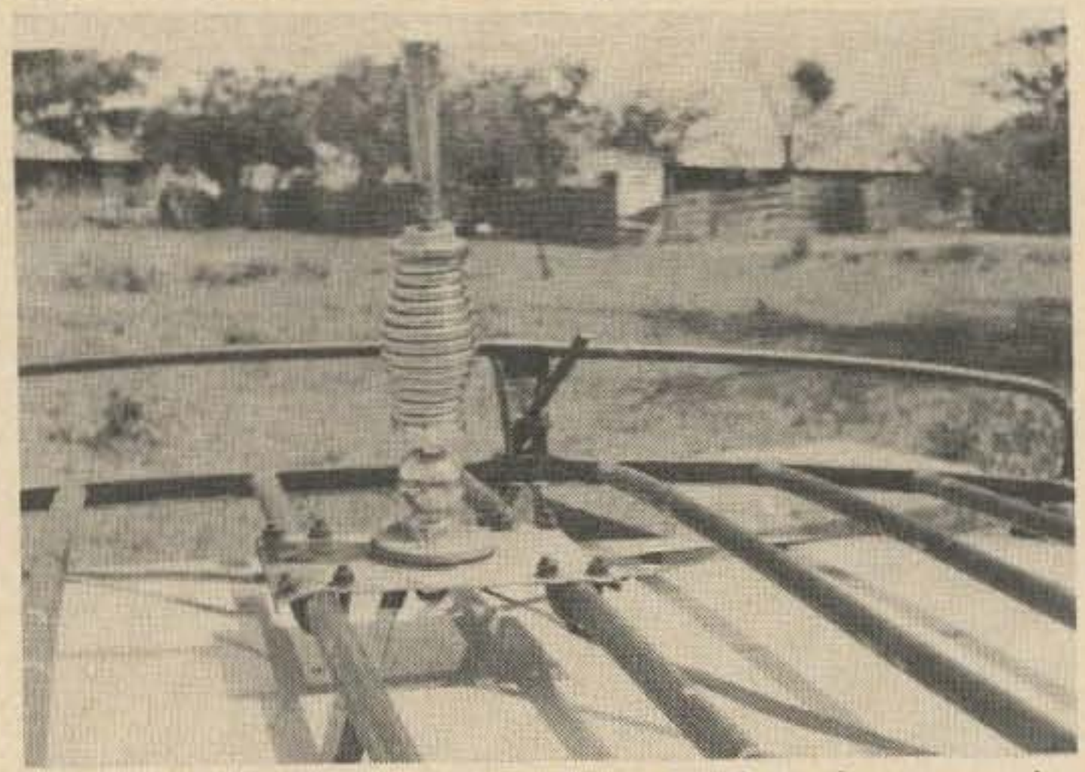
No. 1 was rejected owing to the inefficiency of bumper mounted antennas. No. 2 was tried, but this depends on the gap between trunk lid and body work being about right and also on the trunk lid not having a flange. No. 3 was the method chosen because of the inefficiency of No. 1 and the fact that No. 2 did not fit the car hired.

If a car can be hired with a roof rack, then a steel plate can be made and suitably drilled to take the antenna base. This plate can be mounted between the bars of the roof rack with U bolts.

This system has the advantage of high efficiency but only if a very good low resistance joint can be made between the outer braid of coax feed line and the main body of the car. One should not rely on the contact between the roof rack and the roof of the car. This may well be painted or otherwise it will probably become corroded.

In my case I decided to connect the bolts which held the antenna base to the steel plate. These were also connected to the outer braid of the coaxial cable-direct to the car roof with four copper braid connections at the four corners. I was lucky to find four tapped holes designed to take a different type of roof rack. In any case I did not rely on one copper braid but used four separate connections to our different parts of the roof.

In addition, the trunk lid was bonded by copper braid to the body of the car as was the hood lid, the engine and the tail of the exhaust pipe. Thus the outer braid of the coax feedline was solidly connected to the main metal of the car with a low resistance joint and was able to develop its full radiating possibilities without undue resistance losses.



Where the car has a roof rack, the plate can be mounted between the bars of the roof rack with U bolts. Copper braid connects the bolts to the four corners of the roof.

Where possible an ohmmeter[1,2] capable of reading down to fractions of an ohm should be used to check the resistance from the chassis of the transceiver to any part of the car and this should read less the 0.2 ohm to any part of the car.

To facilitate such an installation in the future, a pre-drilled steel plate to take the antenna base could be carried fitted with some adjustable arms and U bolts to cope with the different spacing between different types of roof racks.

1. Such a meter is manufactured by Evershed & Vignoles, called the Megger MB3

2. See article "How good is your mobile installation," *Mobile News*, December 1966.

In fact the installation described worked very well from Gambia where QSOs were made from the mobile installation to all parts of the world.

Suppression

While it is, of course, true that suppression problems are individual to each car, and can unfortunately only be solved by cut and dry methods, nevertheless certain basic principles apply.

In dealing with a hired car two considerations predominate:

A. No modification can be undertaken to which the owner would object.
B. You are obviously not prepared to spend the time and money which you would spend on your own car, as you will probably only be using the hired car for a relatively short time.

This means that the logical approach is to begin with those items of suppression which are most easily and cheaply accomplished and give the most tangible results. The greater refinements can be left until later and possibly omitted completely if it is not considered worth the effort or expense for the improvement produced.

Surprisingly enough, the first thing to check is the car clock. Some cars are fitted with electric clocks which are electrically very noisy on the high-frequency bands. If it cannot be suppressed easily, it is well worth trying to persuade the owner to have the clock disconnected during the period you hire the car. A noisy clock can cause you serious interference even when stationary and with the engine switched off. Therefore, the first essential is to put this right. All the other interference will disappear when the car is stationary. You can at least operate when parked, even if you have done no suppression at all, **provided** You have cured the clock noise. The best way is to disconnect it with the owner's approval.

Next, check the engine. Many cars will already have been suppressed to some extent. The quickest and easiest way is to fit suppressor resistors at the plugs (it is better to fit suppressed plugs if such are available and you are prepared to spend the money). Then fit one more suppressor resistance in the centre lead of the distributor. Remember there is a spark between the rotor and the distributor contacts as well as in the spark-

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ing plugs themselves. This one additional resistor is often forgotten and makes a big difference.

Next put a feed through capacitor in the main dynamo (generator) lead, or equivalent in the main feed to the battery if an alternator is fitted. Lastly, do some bonding. Of course, you must bond the engine to the chassis or body. Remember the engine is mounted on rubber supports and may be well insulated from the rest of the car. Then the hood lid must be bonded to the body. This lid usually rests on asbestos tape which is quite a good insulator, so the only electrical contact with the rest of the car is through the hinges. These are either lubricated with a good insulating oil or they are rusty; so, unless you bond carefully, you leave the lid over the engine nicely insulated to act as an antenna to radiate engine noise to your own antenna.

This bonding of the lid has already been mentioned before in connection with the antenna mounting and general bonding, as has the bonding of the trunk lid and most important, the bonding of the tail of the exhaust pipe to the body. The exhaust pipe can be a beautiful radiator on 20 or 15 meters in a smaller car since it is about ¼λ long.

At this stage you should have achieved a considerable improvement. Note the regulator has not been tested. Clearly, this can be treated as described in many mobile handbooks and should certainly be done on your own car, but it was felt a break should be made here in hired cars to distinguish, Stage I, what might be regarded as essential, and Stage II, if the hirer feels inclined to devote more time and money to suppressing his hired car.

But at this stage a worthwhile improvement should have been achieved. With a hired Peugeot, sufficient suppression was achieved at this stage to make QSOs on 20-meters possible in motion, though on 15-meters only good strong signals could be copied.

In Stage II a series of further improvements can be suggested, such as—

1. Suppressing the regulator. You can listen to see if this is necessary.
2. Bonding all the sections of the exhaust pipe together. In Stage I only the tail was bonded to the body. But, in fact, all sections and the muffler should be

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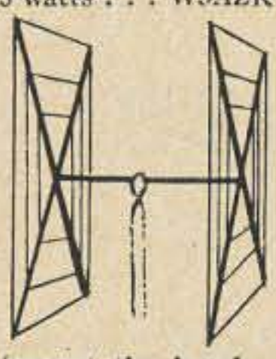

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bonded together as they make bad electrical connections and ignition noise will probably not be fully suppressed until the whole exhaust pipe, mufflers, etc. are carefully bonded together. Here again a good ohmmeter reading really low voltages (such as the Megger MB3 described earlier) is very valuable. On testing one car where a good bonding braid was clearly visible between the tail pipe and the car chassis, a resistance of 2500 ohms was measured. This was not lowered until the whole joint was taken down, cleaned and reassembled and preferably greased with electrolube grease.

3. The accessories may need suppression such as windscreen wipers, petrol pumps, etc. but again this can be left to Stage II.
4. Wheel static and all the other refinements can be considered also.

On a hired car for a short period of use, however, enough may well have been achieved to make reasonably satisfactory mobile operation possible.

. . . G3BID

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Preventive Maintenance

No matter whether you are a DX operator, traffic man or just an average ham looking around for that elusive 50th state, you will recognize the situation. Just as you find the frequency that rare DX is listening on—or get ready to send that important message—or start to answer that W7's CQ . . . The lights flicker, the transmitter fuse pops, the rig goes stone dead and, for the moment, is just about as much value to you as a wad of used chewing gum. If it hasn't happened to you, it's only because you haven't been in ham radio very long. The situation is best described by Murphy's Third Law: "Things always pick the worst time to go wrong."

But it is possible to at least partially remove yourself from the clutches of blind fate. A little pre-planning will reduce the probability of being struck down by Murphy's Third Law. Here's how.

Almost without exception, hams wait until a component or piece of equipment fails before they perform any maintenance. This has two distinct disadvantages. One is that the equipment will fail at a time you are using it. The other is that the failure of one component will sometimes cause the premature failure of a second component.

However, it is possible to anticipate component failure and to minimize unexpected trouble. This can be done by making periodic checks to insure that the equipment is functioning properly, and that no tubes or other components are on the verge of failure. This type of maintenance has been employed by commercial electronic users and the military for many years, and is commonly called Preventive Maintenance, or simply PM.

A system of PM for the ham shack can be as simple or elaborate as the operator desires. The purpose of this article is to give the reader food for thought, so he can decide for himself what degree of PM he wants to use in his own station.

First, take a careful look at the physical appearance of your equipment. Is it dusty and dirty? Are the knobs loose on the shafts? Do you sometimes have to whack the side of the cabinet to make that sticking relay drop out? Hams often learn to live with little faults rather than go to the trouble of repairing them. A good viewpoint to take when checking over the equipment is that it is someone else's equipment which you are considering buying. Then, all these little deficiencies will stand out like sore thumbs.

After you have the appearance up to snuff, the next thing to do is to check the tubes. After all, they are the most common cause of ham equipment failures. It is a good habit to replace the tubes from the sockets where they were, and not switch tubes of the same type. In a few critical cases, such as VHF converters or balanced modulators, switching tubes may require some circuit readjustment.

Now turn the equipment on, again checking it as if you were planning to buy it. Check for dirty switch contacts, noisy audio controls, intermittents, sticking relays, loose cables and connectors, dial slippage, etc. Then after a general inspection, it's time to check out the operation on all frequency bands and all operating modes—especially those you seldom use. When you have made these checks to determine if the equipment is operating properly, it's time to get into more detailed checks.

The receiver is a good place to start. There are various checks and tests which may be performed on the station receiver. Some of these require equipment which most hams don't have access to, but on the other hand, it is possible to make a great many rough checks with a minimum test equipment. If you can get it, a simple signal generator with calibrated output amplitude can be used to check the sensitivity of the receiver. If not, then perhaps you can arrange with another local ham to set up your receivers side by side, tune in a weak signal, and switch the same antenna back and forth between the two receivers. This will give you an indication if the sensitivity is grossly out of order. If you are a weak-

signal specialist (DXer or VHFer), you should have equipment on hand to check the noise figure of your converter or receiver. If you use a T-R switch, you should check to make sure the noise figure of the T-R switch isn't severely degrading the performance of your receiver. This can be done by switching the antenna from the receiver input direct over to the T-R switch, to see if there is a noticeable difference in weak-signal performance.

The dial calibration of the receiver should also be checked. If you have a crystal calibrator, this is the place to start, making sure it is still zero-beat with WWV, or a broadcast station. Then check with the calibrator to see that the dial accuracy of the receiver is OK—on all bands, and at both end of each band. While checking the frequency calibration of the receiver, it is a good idea to check the long-term and short-term frequency stability of the receiver. This may be done by tuning either to a crystal calibrator checkpoint, or a BC station and checking the frequency drift over a short and a long period. Also, the warm-up drift from a cold start can be checked.

There are many other checks which can be made on the receiver, such as the centering of the BFO in the receiver *if* passband, proper Q-multiplier operation, crystal filter alignment, etc. Again, check the receiver as carefully as if you were planning to buy it, and test everything you can think of.

The dial calibration and stability of the transmitter can be checked with the same methods used in checking the receiver. The audio quality and keying quality of the transmitter should also be checked. This is best done with the aid of an oscilloscope, but even without test equipment, you can check this by tuning the transmitter in on the station receiver and listening with a pair of earphones while someone else keys or speaks into the mike. Be sure and have some means for reducing either the transmitter output, the receiver gain, or both, so you won't overload the receiver input.

If you have an SSB transmitter, you certainly should own or have access to an oscilloscope for testing and alignment purposes. You can use a scope to check for flat-topping, carrier, and unwanted sideband suppression, etc.

The rf output of the transmitter can be checked by a variety of methods, such as loading it into a bank of light bulbs as a dummy load, and then comparing their intensity driven by the transmitter to their intensity when plugged into the ac line. SWR bridges can also be used to check relative rf output, by comparing the required sensitivity setting for full-scale deflection (always using the same antenna, frequency and power input to the transmitter).

Speaking of SWR bridges, most hams have blind faith in these devices, but they can go sour too. So check them while making your station check by loading into a flat dummy load, to make sure their calibration is still OK. Also, you can check by measuring the SWR, then reversing the bridge in the line and seeing if the SWR reads the same in both directions.

All the station's accessory equipment should also be checked. A little thought will help you make a checklist to suit your own station. You know what the equipment should be capable of; just make sure it's doing all the job correctly.

There are a number of things to check with regard to the antenna system. You could start by making sure the antenna rotator is pointing the same direction as its indicator box. Then make a complete set of physical checks—worn spots on the feedline, kinks in the coax, connectors (for corrosion, mechanical strength, breakage, etc.), guy wires, turnbuckles, ground connections, and so on.

Safety considerations should never be overlooked. Make sure all equipment is properly grounded. All coax should be grounded as it enters the building, and all fuses of the correct value. Be sure that all adult members of your family know how to kill power to the shack in the event you get into trouble.

As you can see, you can make station equipment checks ranging from very fast, simple checks, to tests which will take a number of hours. It all depends on how involved you want to get. The thing for you to do is to sit down and carefully consider just how involved you want to get in a PM program, and then make you check list accordingly.

Even with a good PM program, it is sometimes impossible to avoid sudden equip-

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Our TV Camera production has expanded to the point where we can produce 2 new cameras in the ½ hour or so it might require for us to troubleshoot rejects; therefore we are making the rejects available at considerable savings. These are new complete with all parts including vidicon and lens, but will not have the VANGUARD label and since they are sold as-is they are not guaranteed.

The trouble may only be a wrong resistor or wiring error, or it might contain a combination of errors—in any case it's a real buy for anyone who knows TV cameras.

We have only about a dozen available and since improved production control is reducing the number of rejects, this offer may not be repeated. Schematic included with order.

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ment failure. To be prepared for these unavoidable failures, you should keep spare tubes and fuses on hand, as well as a few spare components in your junk box. I have always made a practice of keeping a complete set of spare tubes on hand for all radio equipment, to avoid the problem of having a tube failure over a contest weekend, when all the local radio stores are closed.

The table of *Fig.* 1 summarizes some of the things to remember in making up your own PM checklist. Use it as a guide, and adapt it to fit your own needs.

You will enjoy operating more if you avoid the frustration of sudden equipment failure, or reduced station efficiency through improper equipment operation. As Tom Lehrer says, "Be prepared."

EQUIPMENT (GENERAL):
Dust & clean
Check tubes
Dial Calibration
Control functions
Voltage checks
All bands/modes
Noisy controls
Correct value fuses
Spare tubes
Spare fuses
Ground connections

RECEIVER:
Sensitivity
Noise figure
Calibrator frequency
Dial calibration
Frequency stability

ACCESSORIES:
Q-multiplier
SWR bridge
T-R switch
Low-pass filter
Antenna tuner
Control circuits

TRANSMITTER:
Audio quality
Keying quality
rf output
Frequency calibration
Frequency stability
SSB characteristics

ANTENNAS:
Feedline
Coax connectors
Guy wires
Mechanical strength
Rotator

Fig. 1—Checklist Guide for PM program.

. . . K3KMO

RENEWAL CODE

The two numbers under your call on the address label are the expiration code. We have tried to make it simple. The first number is the month that we send you the last copy on your subscription and the second number is the year. 78 would be July 1968, for example.

You Can Pass The Extra

If you can copy press from KFS and KPH which goes out at about 23 wpm, send READABLE code, and know the answers to at least 75% of the License manual or Study Guide questions, there is no reason to muff this test. It's all a matter of your mental and physical attitude when you arrive.

Decide in advance that you are going to take a well-earned holiday and go up to find out what the exam is like, so you will know how to prepare for the NEXT one. No studying or cramming the night before—take the XYL out to dinner and a show. Next morning a very light breakfast or, better yet, none at all. Don't drive your car and arrive tired and tense. Take the train; if you smoke, have a good cigar and enjoy the scenery. At least once, glance over the few tough questions which you have previously marked in red, for a quick review.

The receiving test, which is first, is really very easy. The first 150 letters are plain language; if you miss a letter you can fill it in by inspection. (No, you can't; you don't get time—Ed.) Just try to get the sense of it as you go along remember you are just there to find out what it's like; you don't give a darn one way or the other. There are no mixed code groups as in the commercial exam, no KEIZ de MZL SS Floribel sinking off Point Arena Lat. 38 deg. 50 min. N, long. 123 deg. 47 min. W. SOS SOS SOS. That kind of stuff really separates the men from the boys. (Meet one of the boys—Ed.)

Now that you have passed the receiving test, you have a chance to make a friend of the examiner on the sending test. First get that old rattletrap key into comfortable adjustment and then send a string of V's until your arms and wrist are flexible. Nobody can send readable code with a tense "glass" arm. (I lost more boys to the sending test than any other one thing on the commercial exams.) Remember, don't slur your dots, they are just as important as dashes; send every word solid and firm. Be sure you send words, not just a string of letters which would take a cryptographer to decipher. You think and talk in words, so send that way. Look over each word before you send it; relax your arm or even let go of the key while you look it over. Overlong spacing is a heck of a lot better than too short. And send at a comfortable rate of speed, whether it's 18 wpm or 25 wpm. Even if you are a little slow, the examiner will accept it over ragged unreadable stuff. The real test of a wireless operator is—can he remain cool and send readable code under panic conditions.

If you have maintained your devil-may-care attitude you are now up to the written exam, so don't lose it now. Don't look over all the questions to see how tough they are. Just start with No. 1; if you know it cold answer it. If you aren't sure, pass it up and try No. 2. If you come to one like "Draw a schematic of a radiotelephone transmitter" which is obviously going to take a lot of time, pass it up for now and go on to the end, answering the ones you know cold. Now add up the number you have answered. If it is over 75 percent of the total, hand in your paper, put on your hat and go home. If less, start picking out the easiest of the ones you skipped. Keep working at it until you have over 75%. Remember, on the multiple choice questions you have a 20% chance of being right by just guessing. There is no sitting there and sweating for 4 or 5 hours as some of the fellows do.

If you fail, for another $4.00 you can go back next month and try again. But if you maintain the right attitude, you won't have to. Not your life, not even your job depends on this exam, so keep your cool. Be sure you have a stamped, self-addresses postcard with you to hand to the secretary, and the chances are that you will get it back in Monday's mail with the terse comment "You passed the EXTRA class exam".

. . . K6YA

This article is reprinted from The Footprint, the club bulle'in of the Foothills Amateur Radio Society, Palo Alto, California, edited by Jim Lomasney WA6NIL.

Use of Q-Multiplier to Increase Intelligibility of Received Voice Signals

About twenty years ago, a number of amateur and commercial operators discovered, more or less independently, that the intelligibility of weak phone signals could be increased, in some instances, by judicious adjustment of the crystal phasing control. This procedure still works, but requires a happy combination of skill and luck for its successful employment.

A much greater improvement in intelligibility of weak phone signals can be brought about by the use of a properly-adjusted Villard Q-Multiplier. This increased signal improvement is possible because the "slot" of the Q-Multiplier is substantially symmetrical, whereas the "slot" of the crystal is decidedly skewed. In general, this will work wherever a Q-multiplier is effective—at *if* frequencies of 400 kHz or more. At lower *if* frequencies, the Q-multiplier is usually too sharp, and a bridged-T notch filter is used instead. This also can be used to improve intelligibility.

Procedure for improving the intelligibility of a weak phone signal, by use of the Q-multiplier, is as follows:

With the Q-multiplier off, tune in the signal and center it in the *if* passband.

Remove as much heterodyne interference, noise, etc. as possible by use of the crystal filter, noise limiter, etc.

Turn on the Q-multiplier, set it for "null", back off the "null depth" control toward zero, and tune the Q-multiplier exactly to the *if* frequency.

Advance the "null depth" control until intelligibility is at a maximum. This is usually just below the point where male voices start to sound "tinny". Advancing the "null depth" control beyond this point usually degrades the signal.

Rock the Q-multiplier tuning *slightly* to be sure that it is exactly centered in the *if* passband.

The effect of this adjustment on received voice signals is as if the modulation percentage were increased, and the mid-audio range (300 to 3,000 Hz, approximately) were boosted.

What the Q-multiplier does here, when properly adjusted, is to reduce the amplitude of the carrier and of the lower frequency side-bands, while passing the mid-frequency sidebands unchanged. As total power through the *if* system has been reduced, AVC voltage is also reduced, producing a drop in the S-meter reading, so that the amplification of the *if* system for those sidebands that are passed is increased. As the intelligibility of voice signals depends mostly upon the mid-audio frequencies, which reach the detector with greater amplitude than previously, the effect is desirable, and leads to a net gain in intelligibility.

This procedure works well with male speech in English, French, Spanish, Portuguese, Italian and Latin. It is less useful with some of the Germanic languages, in which low frequencies are more important than in English; and seems to fail completely with some of the intoned languages, such as Yucateca and Cantonese.

Ronald L. Ives;
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(Additional info, see January and March QST)

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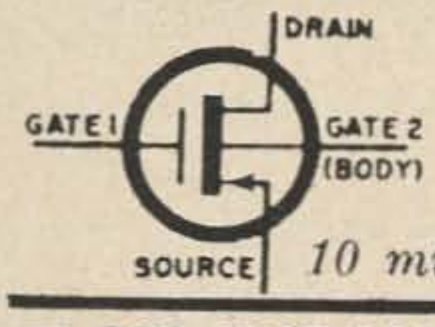

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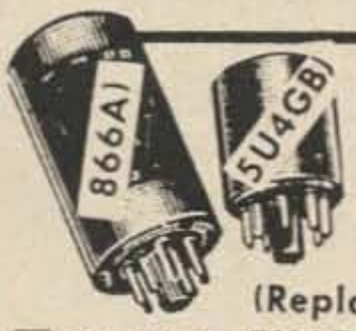

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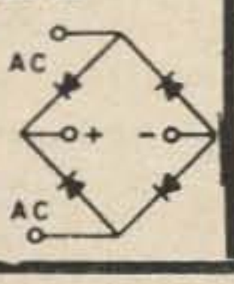

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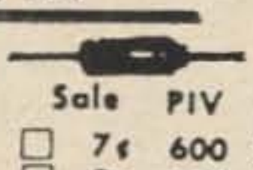

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400	☐ .16	☐ .40	☐ .50	☐ 1.50
600	☐ .20	☐ .55	☐ .75	☐ 1.80
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Crystal Etching Tips

For etching crystal blanks use a saturated solution of ammonium biflouride in a plastic container. The crystal can be held on the edges between two wooden strips which have been fastened at one end and the crystal end suspended in the solution. You don't need a large amount of solution, just enough to cover the crystal. Use another plastic container with clean water and a small amount of baking soda for the first rinse.

Don't assume that all crystal blanks will move the same in a given time period. Some move faster than others. Better make a few trial runs and see how far each blank moves in one minute. It may be as much as 2kHz on some. Don't try to move a blank more than 25 kHz as the activity falls off drastically and it is almost impossible to restore it. If, during your etching, the activity gradually diminishes, this is probably due to the acid rounding off the edges. One swipe on each edge across a piece of fine production finishing paper (3M A wt.) will help square up the edges. Hold the blank straight up and apply light pressure. This will increase the frequency so make the necessary allowance. Also, beveling the edges in the same manner will sometimes pep up activity but this is tricky and not recommended except as a last resort. Rotating one electrode may help.

The blank must be perfectly clean for best operation. Soap and water with a tooth brush for scrubbing is best. Rinse thoroughly. Hold blank on edges between thumb and forefinger when handling to avoid fingerprints on the flat surfaces. Electrodes should be cleaned in the same way. Dry with a clean, lint-free cloth.

Blanks can be moved up and down in frequency as much as 2kHz with different electrodes. If your project calls for just a small movement, it is better to get a supply of electrodes and try them first. Different electrodes produce varying amounts of activity so you may have to choose a compromise set which gives the required output and frequency. Also, the amount of spring tension will affect the frequency. Make final frequency check in the FT-243 holder in the equipment in which it is to be used.

If you are etching blanks for a filter, remember that the input capacity of the oscillator used for frequency checking may be different from the capacity of the filter circuit. Check the filter curve after each etching.

If you plan to do much crystal etching you will find it is a tedious job to remount the crystal in an FT-243 holder after each etching in order to check the frequency and activity. Here's a gadget which will eliminate this headache.

Some series of CR1A/AR holders, usually a brown case, have a rectangular or square insert in which the crystal and electrodes fit. A spring clip is used for pressure instead of the conventional wire spring. It is simple to slip the insert (holding the crystal and electrodes) into the holder along with the spring clip.

The pins on the CR1A/AR holder have the same spacing as FT-243 but are larger in diameter. It is possible to saw off these pins close to the case and solder to the stubs the bottom part of an FT-241 holder (low frequency type, channel 45, etc.). This holder has the same pins as FT-243. If you use a separate oscillator rather than your transmitter for checking frequency, mount a 5-prong socket for the crystal and the CR1A/AR fits perfectly as is.

. . . W4AYV

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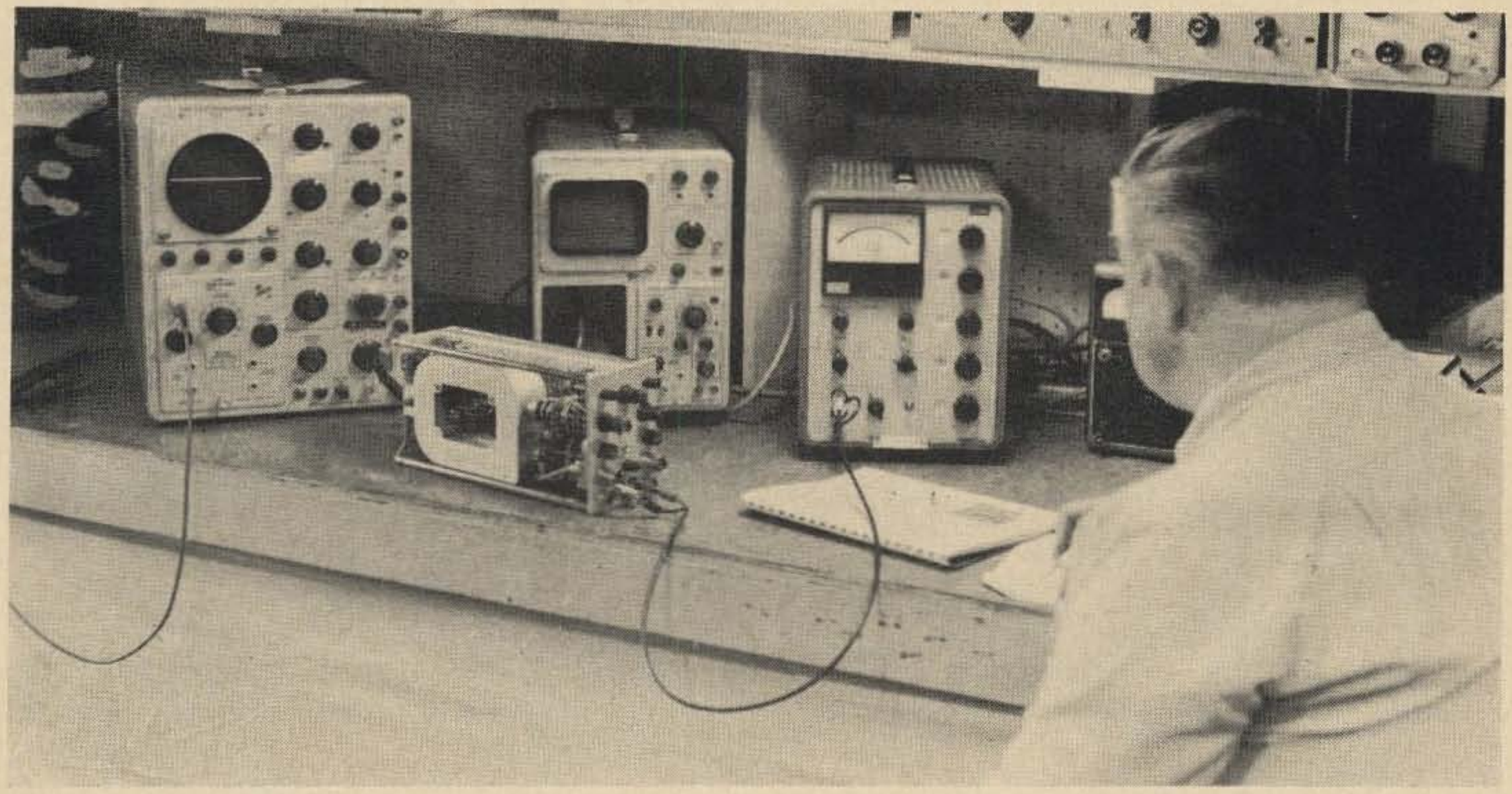

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Operation Salvation Army

Southern California radio "hams" working with The Salvation Army have played a vital role in meeting disaster needs. They are ready to spring into action in the next emergency, whether it be a forest fire, earthquake or any other calamity.

Shortly after its organization in 1959, The Salvation Army Disaster Communications Net, a volunteer organization of radio "hams", proved its worth.

During the week of October 13-20, a major forest fire raged in the Angeles Crest highway section near Los Angeles. The Salvationist forces worked long and hard, bringing coffee and snacks to weary firefighters. Working eight days, 24 hours a day out of an improvised control center set up in the Army's Men's Social Service Center, the Net helped the mobile canteens maintain perfect communication with headquarters.

Although The Salvation Army's canteens, station wagons and trucks were already equipped with two-way radio communication, the Net met an important need. There are certain dead spots from which the Army's own radio transmitters and receivers cannot operate, but the "ham" sets had no difficulty operating on other frequencies. Twelve volunteer operators passed 601 messages during the emergency. Thus, the "Ham" network working closely with the regular Salvation Army Net, provided constant communication with those in the fire area.

Operating with their new crystals for the first time, the "hams" transmitted on 50.250 and 50.850 megacycles with unvarying success. Their range is indicated by the fact that messages from firefighters imported from New Mexico were successfully sent to relatives back home.

Another dramatic instance of effectiveness took place during the Alaskan earthquake of 1964. The Net achieved direct communication with amateur operators in the emergency zone, providing a dependable and important avenue of communication that greatly assisted in forwarding emergency supplies to the areas where they were most needed.

Today the 85 member Net has its headquarters at The Salvation Army's Men's Social Service Center in Los Angeles. The master transmitter and antenna are permanently installed there.

The Net operates at the Long Beach Camp Meetings in August and the County Fair in September, sending messages of greeting to all parts of the nation free of charge.

Once a year it holds a dinner and election of officers at the center. Notable authorities in the broadcasting field are guest speakers.

To insure readiness, there are equipment checks of all transmitters every two weeks. In addition, a roll call is held on the air every Wednesday evening, when all forty transmitters are in direct communication with the master transmitter.

Location of the Net's headquarters at the Men's Social Service building makes possible close cooperation between the two groups. Manpower, kitchen facilities and garage services are right at hand and available on a 24 hour basis—invaluable when disaster strikes.

Disaster service is only one aspect of The Salvation Army's extensive spiritual and social welfare ministry which seeks to meet need at the point of need. Hospitals, day nurseries, centers for alcoholics and homeless men, community centers and counseling services are among the various other ways in which The Salvation Army extends a helping hand.

The Salvation Army Disaster Communications Net hopes disasters are far off—but is prepared to spring into action on thirty minutes' notice whenever needed.

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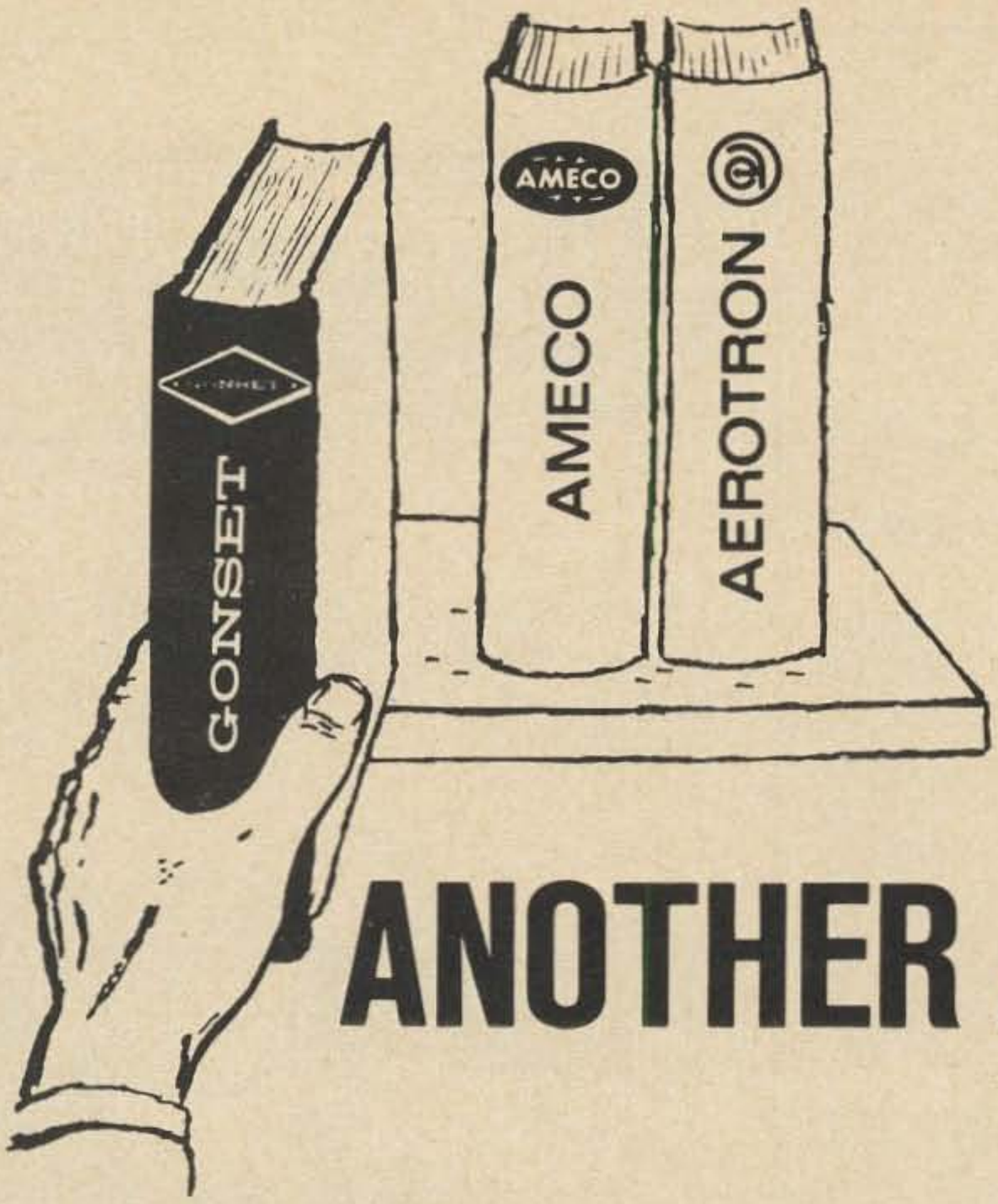

ANOTHER ADDITION

AEROTRON is proud to announce the acquisition of the famous Gonset line of quality amateur radio equipment. This acquisition appreciably broadens the line of equipment and components which we have to offer to the amateur and related markets. We are now shipping directly from our award-winning plant in Raleigh, the Gonset Communicators, Single Sideband VHF transceivers, HF and VHF linear amplifiers and other items bearing the Gonset name. In the coming months we will have even more.

AEROTRON, with more than twenty years in the two-way radio manufacturing business, has also acquired the AMECO Equipment Corporation during the past year. Ameco, formerly of Mineola, New York has been completely moved to our Raleigh plant and we are constantly adding to this popular line of economically priced equipment which is sold by more than a thousand radio supply outlets throughout the country.

The **GONSET** name has been a familiar and respected one by hams the world over for many years. It is with a great deal of pride that we now have it as a division of Aerotron, Inc.

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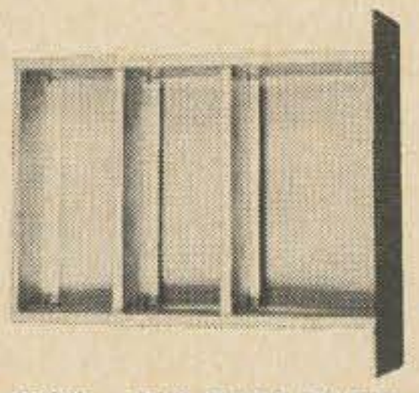

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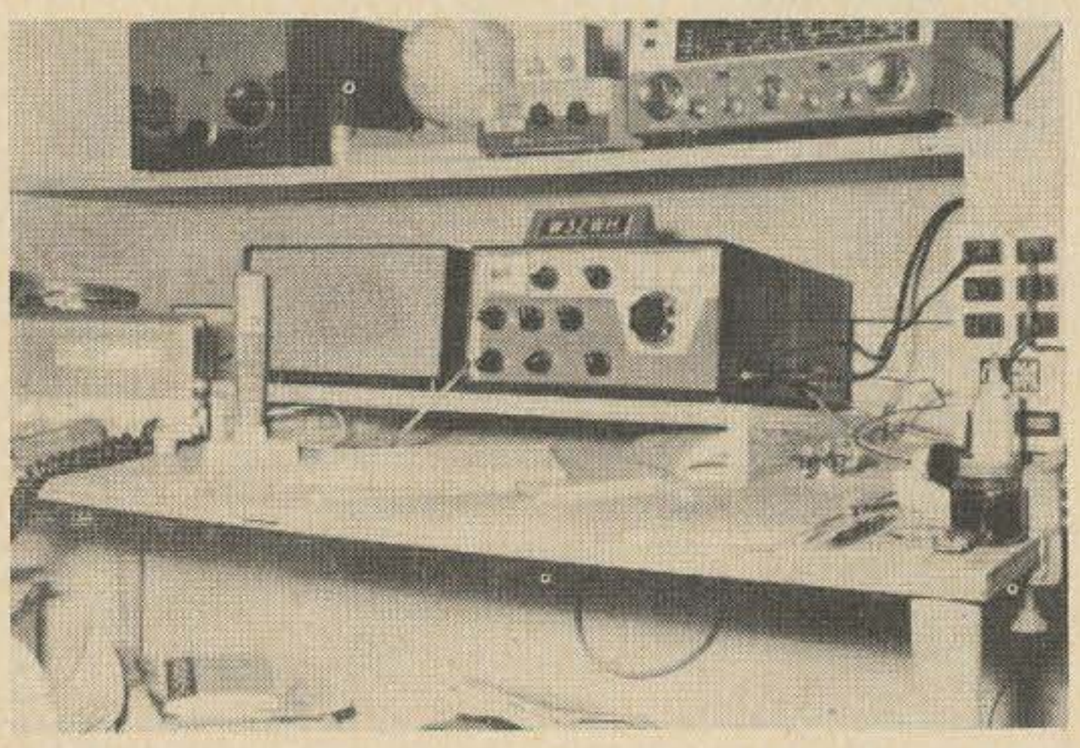

As you can see, construction of the shelf is utter simplicity. Mine is made of ¾ inch plywood. This was used, because it was available, and because I did not want the shelf to sag under the weight of the power supply and transceiver.

Wood screws hold the three pieces of wood together. Holes were drilled to match the feet on the bottom of my equipment. These holes as well as the dimensions of the shelf can, of course, be varied to suit your individual needs. Also, by leaving the front of the shelf open, you will have a handy storage space for logs, pencils, etc.

Finish the shelf with a coat of paint, and that's all there is to it. Build one and you'll be surprised at the difference it makes in operating convenience.

. . . Joseph M. Plesich W8DYF

Propagation Chart

APRIL 1968

J. H. Nelson

EASTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	14	14A	14	7A	7	7	7	7A	14	14	14	14
ARGENTINA	21	21	14	14	7	14	21	28	21A	21	21	21
AUSTRALIA	21	21	14	14	7B	7B	14	14A	14	14	21	21
CANAL ZONE	21	14	14	14	7A	14	21	21	21A	28	21A	21
ENGLAND	14	7A	7	7	7A	14	14	14	21	21	21	14
HAWAII	21A	21	14	7B	7	7	7B	14B	14	21	21	21
INDIA	14	14	14B	7B	7B	14B	14	14	14	14	14	14
JAPAN	14A	14	14	7B	7B	7B	14B	14B	14	14B	14	14A
MEXICO	21A	14	14	14	7A	7	14	21	21	21	21A	21A
PHILIPPINES	14A	14	14	7B	7B	7B	14B	14	14	14	14B	14
PUERTO RICO	14	14	14	14	7A	14	14	14	21	21	21	21
SOUTH AFRICA	14	14	7B	14	14B	21	21A	21A	28	28	21A	21
U. S. S. R.	7B	7	7	7	7B	14	14	14	14	14	14	14
WEST COAST	21A	21	14	14	7A	7A	14	14	14	21	21	21

CENTRAL UNITED STATES TO:

ALASKA	14A	14A	14	7A	7	7	7	7A	14	14	14	14
ARGENTINA	21	21	14	14	14	7	14A	21	21A	21A	21	21
AUSTRALIA	21A	21	14	14	14	14	14B	14	14	14	21	21A
CANAL ZONE	21	14A	14	14	14	7A	14	21	21	28	28	28
ENGLAND	14	7A	7	7	7	7A	14	14	14	21	21	14
HAWAII	21A	21	14	14	14	7A	7A	14	21	21	21	21A
INDIA	14	14	14	14B	7B	7B	14B	14	14	14	14	14
JAPAN	14A	14	14	14B	7B	7B	7B	14B	14	14	14	14
MEXICO	14	14	7A	7	7	7	7	14	14	14	21	21
PHILIPPINES	21	21	14	7B	7B	7B	7B	14	14	14	14B	14
PUERTO RICO	21	14	14	14	14	14	14	21	21	21	21	21A
SOUTH AFRICA	21	14	7B	14	14B	14	21	21	21	21	21A	21A
U. S. S. R.	7B	7	7	7	7	7B	14	14	14	14	14	14

WESTERN UNITED STATES TO:

ALASKA	21	21	14	14	7A	7	7	7	14	14	14	14
ARGENTINA	21	21	21	14	14	14	14	21	21	21	21	28
AUSTRALIA	28	28	28	21A	21	21	14	14	14	14	21A	28
CANAL ZONE	28	21	14A	14	14	14	14	21	21A	28	28	28
ENGLAND	14	7B	7	7	7	7	7B	14	14	14	14A	14
HAWAII	28	28	21A	21	14	14	14	7A	14A	21	21A	28
INDIA	14A	21	14	14	7B	7B	7B	14B	14	14	14	14
JAPAN	21	21A	21	14	14	14B	7	7	14	14	14	21
MEXICO	21	14	14	7A	7A	7	7	14	14	14	21	21
PHILIPPINES	21	21A	21	14	14	14	14B	14	14	14	14B	21
PUERTO RICO	21	21	14	14	14	14	14	21	21	21	21A	21A
SOUTH AFRICA	14	14	7B	7B	7B	7B	14B	14	21	21	21	21A
U. S. S. R.	7B	7B	7B	7	7	7B	7B	14B	14	14	14	14B
EAST COAST	21A	21	14	14	7A	7A	14	14	14	21	21	21

A. Next higher frequency may be useful at this hour.

B. Very difficult circuit this hour.

Good: 1-4, 6-8, 15, 16, 18-20, 22, 23, 25-27, 29, 30
Fair: 5, 11-14, 17, 21, 24, 28
Poor: 9, 10
VHF: 14-17, 22, 26

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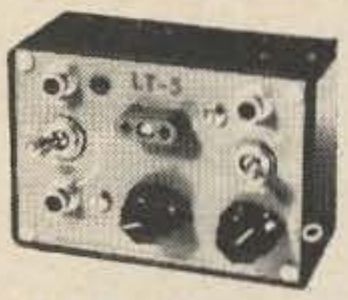

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station transmitting. And any one of the stations can alert all of the others when something is spotted.

If we were to establish a net frequency on 80, 40 and 20 meters for UFO reporting we could arrange for a single tone to be transmitted when an alert came along which would turn on all of the loudspeakers of participating stations. Thus all of us could have a receiver set up on a net channel all of the time, running silently. Amateurs in every community in the country could ask their local police, CD, etc., to call them immediately if any sightings are reported.

When something is reported anywhere the local amateur station would call in on the net and the net control would send the tone to alert the entire net. Once the area of the contact was established amateurs in the area toward which the UFO was headed could alert their police and any others interested. If scientific teams are ever available they would have a warning and might be able to intercept the UFO's.

A net like this could be formed immediately and could build as interest widened. All it takes is one single man with the interest and time to make it click. One man, if he has a good station, could start in as net control and open the net evenings as a starter. Eventually the net should be open around the clock, I should think. The automatic alert can come along later, though it is simple enough. A two-tone oscillator into a sideband transmitter will give out a nice audio tone for operating relays on quieted receivers. We used to send RTTY messages like that twenty years or so ago, so it works well. Simple too.

In terms of value provided by amateur radio to our country a service like this could dwarf everything else we have ever done. Just one good UFO success and we will have paid for ourselves thousands of times over. And think of the enormous publicity we would receive just for setting up such a reporting system. This would be in every newspaper in the country, if not the world, and would be there over and over. All the police forces in the country would be familiarized with us and would depend on us for their UFO communications. And if the government ever takes a serious interest in the problem they, too, would be entirely dependent upon us for communications.

If anyone is interested in going ahead and forming a UFO reporting net why not

get together on, say, 14250 as a starter. It may take a few weeks to get going, but seldom does a week go by without there being a reasonably valid UFO report around the U.S. Let me know by mail what is going on and I'll report it in 73.

Step Two

If we are able to provide the depth and breadth of communications needed to bring the UFO problem to a head and it turns out that they are, as so many people sincerely believe, space craft, then the next step is to make some attempt to communicate with them. Here again amateurs have a big advantage over everyone else. We are everywhere. We can organize radio, light, and other mediums of attempted communications and have a fair chance at them because our net will tell us where the UFO's are at any moment and give us a good idea of where they are heading next. If I have a chance to set up my surplus signal light a few minutes ahead, I can guarantee that the UFO pilots will have to be blind to miss it.

First things first. Please don't let me and everyone down by leaving the UFO reporting net to someone else. If you can't get on 14250 you might try 7250 or 3900 kHz. Let's GO.

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Take Uncle Alf's Advice and You Will Do All Right

It's a nice day today, but band conditions are lousy. Why don't we drop in on Uncle Alf and see what's going on over at his place? He is a DXer of some accomplishment, and sometimes one can pick up some real nuggets of wisdom by sitting quietly in the corner with an ear open. True, it's sometimes necessary to switch in a 200 Hz filter to eliminate some of the stuff that goes on. But generally Uncle Alf has been known to put out some pretty good data from time-to-time.

Right now Uncle Alf is pounding away on his old Oliver typewriter trying to make a buck so he can replace his 4-250A that blew during the DX test. That tube made a rather good but expensive fuse, with 3 kV on the plate with nowhere to go but up, and no −150 volts on the grid. But that's the breaks . . . win a few, lose a few.

Anyway, Uncle Alf is working away when the screen door bangs, and in walks Simple Simon Q. Sideband from over at Finksville Jct, looking down-at-the-mouth. Very sad, indeed. He is clutching a bundle under his arm.

Uncle Alf is smoking his pipe, so S. S. offers him a cigarette. "What do you hear, old buddy?" says Uncle Alf. He thinks maybe S.S. is returning the grid dipper he borrowed last summer, but S. S. unwraps the package and tosses a hank of co-ax cable and some number 14 wire onto the table.

"Uncle Alf," says S. S., "See this stuff? I put myself in hock to the tune of $36.95 with the Finksville Friendly Financial Foundation so's I could buy it, and it ain't working worth a darn."

Knowing already what's the problem, Uncle Alf says, "I see it. What's the problem?"

Simple Simon says, "Well. It's a custom-made inverted Vee dipole, supposed to have real low radiation angle such as is pre-ferred by them DX signals on twenty and fifteen. But it acts crazy." Uncle Alf is tempted to say something appropriate like, "You should know," but instead he picks up the wire and looks at the feed point.

"Simple S. old buddy," says Uncle Alf, "what happens to your TV set when you fire this thing up?"

Simple looks kind of sheepish. "Yeah. That's another thing I was going to mention," he says. "I was in this pileup yesterday when I heard a terrible crash. Seems that ole Missus Figbottom next door snuck over and cut down my guy wires. I guess her TV set had a slight attack of raster disaster." S. S. starts picking up little bits of solder off the workbench. "Waste not want not, I always say," he mutters, and sticks them into his pants cuffs.

A wave of pity sweeps over Uncle Alf and he says, "S. S., I am going to impart to you some very interesting data. I am going to dip into my good oats bin and show you how to resolve your problem."

S. S. looks pleased. "I read you good, Uncle Alf. Dah-de-dah. That means "go" to you CW types," he smiles.

Uncle Alf, who has never worked phone in his life and never intends to, picks up the wire. "Just look at this (ptui!) antenna you are using," he says, tapping the feed point.

"Like I said, it cost a lot of scratch," says Simple S. "What is wrong with it?"

"Well," says Uncle Alf, who has been a ham for 32 years and is knowledgeable in this area, "in the first place, you can't feed a balanced system with an unbalanced transmission line and expect the thing to work right. Your TVI is probably being caused by radiation from the feed line. These inverted Vees, which is a misnomer because they are not true Vees, work pretty good if, and only if, they are properly fed. What you need is a method to get rid of antenna currents on the line, old buddy."

"Aw, I already tried that," says S.S. "I put a quarter wavelength of RG-8/U on the line exactly as it says in THE handbook, but I still got the TVI."

Uncle Alf restokes his pipe. "How do you know it was a quarter wavelength long?"

S.S. picks up THE handbook. "Right here, on page 331, see? This picture shows a dipole fed with co-ax and a linear balun (whatever that is). It says the balun should be a quarter wavelength long. I measured mine like THE handbook says."

"What it doesn't say, among other things," says Uncle Alf, "is how far the co-ax balun should be spaced from the transmission line, assuming both line and balun are the same material, as in your case. The dielectric between the line and balun affects the velocity factor of the balun, which in turn affects the electrical length. If you strap the balun right onto the line, the vinyl jackets will constitute an appreciable part of the dielectric between line and balun. The old formula for finding the physical length for a quarter-wave section is fine, but you got to plug in the right number for V, the velocity factor. Now, if the balun and line are air spaced between one half and one inch, then the velocity factor is something different."

Simple S. wags his head in awe. "Oh what knowledgeable words you are sending," he says, "but what should the length be for my balun if I want it to work on 14 MHz, say?"

"If you are going to tape the balun to the line, the balun should be 11.5 feet long. However, if you space the balun away from the line about an inch, the balun length should be 16.6 feet."

Simple Simon says, "Uncle Alf, I wonder how come they don't tell that good data in this here handbook? They been printing it for years with the same stuff, never changing it, and seems to me they could put that velocity factor business in with the directions on the balun where it will be useful."

Uncle Alf's eyes narrow, and a wicked grin appears on his handsome features. "Oh so right, S. S. old buddy. However, let us not belabor the point now. Maybe someday somebody will do something about that."

S. S. picks up his junk and gets ready to leave. He says, "You know, Uncle Alf, you are so kind and generous to program me on how to cure my TVI troubles, I am going to let you in on a little secret. I found a way to really make them rare DX ops sit up and take notice when I send them my QSL cards."

"Yeah?" says Uncle Alf, "how's that?"

"All's you do is paste on some of them Chiquita Banana stickers. Man, that really gets results."

"Yeah," says U. A. "Thanks. I'll store that little tidbit into my memory core for future reference. Never can tell when it might come in handy for a little do-it-yourself hint."

. . . W6NIF

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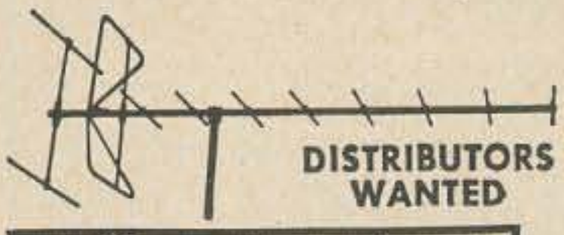

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Letters

Dear 73,

I would just like to sit down and take a minute to express my sincere appreciation to the FCC for the forthright manner in which they handled this incentive licensing program.

In spite of continual griping and pressure from selfish (lazy?) amateurs and others, they went right ahead and did something which needed to be done, and I for one am with them 100%

Remember that FCC rules shoud not be based on "popularity", but on what is for the best interest of the public at large, and this incentive licensing cannot help but take a long step in that direction.

Richard B. "Red" Blanchard, Jr. W6AG
No. Hollywood, Calif.

Dear 73,

. . . I have often read articles establishing amateur radio as a hobby and public service vehicle. It is one that has many facets, ie: building, CW, traffic handling, rag chewing, and experimenting. These very articles establish an obvious fact, that all people are not interested in the same things and that "hamming" is attractive for one reason, amongst others, that it offers many things to many people.

For those among us who are "only" operators, who pass traffic, handle phone patches, who take the time and effort to study for and pass the technical and CW tests for their very coveted and totally enjoyed license and who are proud to be hams, I offer this thought. To select that portion of hamming that interests you most and to do it to the best of your ability doesn't leave you open to justified criticism.

Lawrence J. Felman WB2ZRR
Parsippany, New Jersey

Dear 73,

Amateur radio is dying and the FCC is burying it. The new incentive licensing will do that nicely.

If the idea is to attract newcomers to ham radio and to keep ham ops advancing the technical phases of the art, the last thing that is needed is a higher code speed. Some people cannot copy code at 13 WPM.

If new advances in the technology are desirable, lets promote that instead of a higher code speed and give the phone operator something to shoot for. How about a Technician Advanced Class requiring 5 WPM and the Advanced technical test allowing operation on low band phone? This would eliminate the appliance operator and give the technician a chance at technical advancement in HF as well as VHF. Why make the phone man up his code speed to stay in business?

John Beal WA9UKH
Wauwatosa, Wisconsin

Dear 73,

I enjoyed reading your article in Jan. 1968 edition, on Boy Scout Jamboree. I believe the article and picture will explain to some people the Scouts interest in amateur radio. One of their First Class requirements is Signaling, either by Morse or Semaphore code.

Your last line of the article, "What better way to get youngsters interested in our great hobby than activity like this one with the Scouts", sums up my feelings about Scouting and hamming.

Paul Thoerner WA8DFH
Dayton, Ohio

Dear 73,

I am writing this letter in reference to the article **Novice Data** by Bill Welsh W6DDB, in the January 1968 issue. I wish to call attention to his instructions on how to establish contact. It says that in calling CQ, answering a CQ, and during a contact, one is to conclude his transmission with "AR K". These instructions do not agree with pages 19 and 20 of the **ARRL Operating Manual.** Here is it clearly stated that when CQ is called "K" and not "AR" or "AR K" is to be used. It goes on to say that the answer to a CQ is to be concluded with "AR" not "K". Many hams are writing articles about improving operating practice, but we will get nowhere if misinformation is published.

David F. Jambor WN2CDI
New Brunswick, N.J.

I couldn't agree more, David. However, FCC and not ARRL is the authority we must follow on regulations. This section is rather vague, but in examples given the calling station is to use "AR" at the end of a transmission and the answering stations signs "K".

Dear 73,

Back in the early 1920's, some of us early experimenters thought we heard signals from outer space. In fact, the Army did believe this enough to erect some antennas and do considerable listening on the VLF and BCB wavelengths. For some thirty years, I have had to all but give up DXing and experimenting. Now being on a pension, I can once again satisfy my curiosity regarding whether or not what we thought were signals from space were but hydrogen emanations from some unknown source.

Now I am wondering whether or not the "UFO's" have ever tried to communicate with us also. While I have observed these objects all the way from up around Bethlehem to Key West, I still don't know anything factual about them. So, I am wondering if you would print a short request asking any hams that have any opinions on the subject to contact me. If this is done, I will act as a clearing house for this information and keep you informed of what I learn.

Carl L. Horton WN3JET
3753 Kanawha St., N.W.
Washington, D.C. 20015

Dear 73,

Don Marquardt is a traitor!

In his August article, "A Simple Cavity for Six Meters," he starts out great by pointing out the honest merits of a transmitter cavity; the reduction of TVI by minimization of fundamental-frequency harmonics. But in the second paragraph he blows the whole thing by virtually promising that the cavity would eliminate channel 2 interference.

A great many of us on six meters have tried very hard to educate our neighbors to the fact that in **most** cases, channel 2 interference is attributable to an excessive broad TV front end; and that **nothing** can be done at the transmitting point to alleviate the problem . . . the only practicable answer to channel 2 headaches is viewer education.

I strongly suggest that author Marquardt needs to do some boning up on adjacent channel interference And, for a starter, I humbly refer him to my own article, "The Key to Peaceful Coexistence (Between Six Meters and Channel 2)" which appeared in the February 1966 issue of **73 Magazine.**

Ken W. Sessions, Jr. K6MVH
Ontario, California

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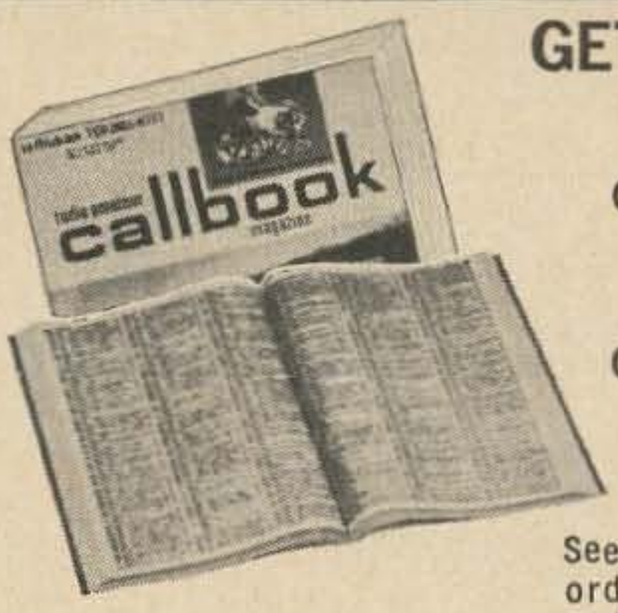

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Dear 73,

I would just like to take this opportunity to congratulate you for publishing the best magazine in the electronic field. I have ample opportunity to review many technical electronic publications here on the campus of MSU, but none are more up-to-date than 73. I have been constructing several transistor projects, the circuits for which I was unable to find anywhere except in 73.

Jim Stermitz WA7AZN
Bozeman, Montana

Dear 73,

I understand that you stand behind your advertisers, and that an ad in 73 implies integrity and service. I am writing in reference to an ad on page 96 of the December 1967 issue of 73, placed by "Pete" Fragale W8AEN. A few weeks ago, I developed a need for some heavy duty diodes, and spotted Pete's unobtrusive ad in 73. I placed an order with Pete for 21 epoxy diodes, and asked him to fill my order as soon as possible because my transmitter was out of commission for lack of plate power until I received them. In less than a week, I had the diodes. Pete had sent the order Air Mail Postpaid. Not only that, he included three extra diodes free.

Just wanted to let you know how reassuring it made one of your readers feel to find a businessman as interested in **giving service** as in making a buck.

73 continues to be superb. Keep up the good work.

Stanley L. Tippin W4VMR
Valparaiso, Florida

Dear 73,

Hope you like the verse attached.
Lady Editor
Hurrah for Kayla at "Seventy Three",
It needed the woman's touch
For warmth and charm in its chapters
And sparkle which means so much.
To carry the cause of the gentle ones,
Make adjustments here and there,
And develop this wonderful craft of ours
To a truly family affair.
An appeal to all ages, both boys and girls,
May the amateur story be sung,
A blend of service, of technique and fun,
To keep us forever young.
We have a motion to pass along,
My XYL says it is great,
On the cover, lets follow the 73
By a slant bar 88!

Dan A. Hoover W9VEY
Lafayette, Louisiana

Dear 73,

We want to congratulate you on the great magazine you are publishing for the ham fraternity. We like the attitude that every reader is not an experienced engineer. We especially enjoyed the series of articles on the novice subject. The easily understood technical articles are especially helpful and meaningful to a new ham.

Being only on AM, we would appreciate any information on conversion to DSB. 73 indicated that conversion was a rather simple matter, but we do need some procedural instruction.

Henry G. Davis, Jr. WA9TNL
Maywood, Illinois

A DSB conversion article will appear in an early issue. The drawings are being prepared at this time.

THE HERB GORDON SWAMPSCOTT HAMFEST SPECIAL!!

So as to enable the maximum number of hams to get the very best value in a 5 band SSB transceiver, and also as a means of expressing our thanks for the business which you have given us over the past several years, we are making the following unusual offer.

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50	.50	.75	400	1.60	1.90
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"TAB" * SILICON ONE AMP DIODES

Factory Tested & Guaranteed

Piv/Rms	Piv/Rms	Piv/Rms	Piv/Rms
50/35 .05	100/70 .07	200/140 .10	300/210 .12
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**All Tests AC & DC & Fwd & Load!*

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45	.80	1.20	1.40	1.90
160	1.85	2.90	3.50	4.60
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D. C. Amps	400Piv 280Rms	600Piv 420Rms	700Piv 490 Rms	900Piv 630Rms
12	1.20	1.50	1.75	2.50
** 18	1.50	Query	Query	Query
45	2.25	2.70	3.15	4.00
160	5.75	7.50	Query	Query
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TO3/60 to 90 Watt 3 to 6A, up to 80V, up to 100hfe, 2N2138, 39, 40 & 2N1529, 30, 31, 2N2526, 90c@ .....6 for $5

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Welch Duo-Seal 1402B Lg Cap Hi Vacuum 140 Ltrs/M & Mtro Mint & LN Consolidated Vac. Corp PMC115A Diffsion "ION" Pump, & Like New HiVac Valve CVC#VCS21, Like New Temescal VAC Value, New.

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MiniFan 6/12 VAC/60cy & Blade ..3/$5
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Leece-Nev 100A/12V3PH Sil Rect ..$16
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.012@25KV "CD" Hy/ Capacitor .....$3@, 4/$10
Vaccum, RF/50MMF/20KV, $4 ea, 3/$10
Mica .01MFD/8KV RF/XMTG, $2@ .....6/$10
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WE #150/Low Freq Carrier Coils, 5/$1
WSTGHS HiVolts 10KV Scope $35
SPERRY RF Lab Scope $35
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Relay 115VAC RBM 3A/ND .....2/$2
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SELL: Magazines; EICO 536A; complete ATV Experimenter; 2.4" telescope; 5 transistor amplifier; Johnson low pass. Stephen Clifton, WA2TYF, 800 West End Avenue, N.Y., N.Y. 10025.

RESCUE THE GOOD 'OL SPIRIT OF AM ham radio from the cost and complexity of SSB! Now you can build that long awaited 500-watt plate modulation system complete for less than $50! Cost reducing plan only $1.50. Write: Tradewinds, P.O. Box 1254, Fort Wayne, Indiana.

QSLS??? Large variety samples 35¢. Sakkers Printery, W8DED, Holland, Michigan.

CHRISTIAN HAM FELLOWSHIP now being organized for fellowship and gospel tract efforts among hams. Christian Ham Callbook $1 donated. Free details write Christian Ham Fellowship, Box 218, Holland, Michigan 49423.

RUBBER ADDRESS STAMP including call letters in exchange for one silver dollar, any year, for my private collection. Cheryl Lynn, Box 1111, Homestead, Florida 33030.

FOR SALE: Lafayette HA-350 receiver, DX-60 xmtr., Hy-Gain 80-10 Vertical trap. All in good condx. Will ship. First $200.00 M.O. takes it. WA9QMY, R.R.2 Box 34-A, Berne, Ind. 46711.

FOR QUICK SALE: NCX-3 transceiver, NCX-A ac supply, NCX-D dc supply. Sold together only. Excellent condition. Write: WA9RNP, 1211 Fairfield Ave., Indianapolis, Indiana 46205.

SWAP—WANT: Have two nice Collins R-388 (51J-3)s that I would like to trade for one Collins R390A or R391. Have other items also. Also will sell R388 for $395.00 FOB each. Need Collins PTO type 70HIZ. State price and condition. Inquiries or offers on above invited. P. F. Collins K9BJN, A317-452-6662.

TRADE, EICO 753, s s vfo, h b power supply, for early American FLINTLOCK rifles or pistols. Write: Andrew R. Sabol, 301 Osborne Ave., Waterville, N.Y. 13480.

SBE-33 SSB TRANSCEIVER—Perfect; in original carton, with complete instructions. First check for $180 buys. Stephen O. Cook W8GXN, 1344 Marion St., Niles, Michigan 49120.

COLLINS 51J-4 serial 6129, mint condition, $650. Tektronix 531, $500. Hewlett Packard 150A Oscilloscope, $500. New London 100B FM signal generator, $300. Balantine 314 ACVTVM, $125. Plus lots more. Roger M. Miller, 6521 30th Ave. No., St. Petersburg, Florida 33710, Phone 343-1427.

WANTED: HRO-500 low freq preamp also rec'vr carrying case, cash or trade. E. M. Fischer, RT3 Box 544, Anacortes, Wn 98221.

THE MOULTRIE AMATEUR RADIO KLUB is having it's 7th annual hamfest being held at Sullivan, Illinois, in the American Legion Pavilion, April 28, 1968.

WANTED: Electrically controlled crank-up tower 70′ or taller. Must be reasonably priced. Don Gallagher K8WZX, 4908 Lefferson Rd., Middletown, Ohio 45042.

SBE-33 FOR SALE. 80-15 meters SSB transceiver 135 watts. Good condition for $168. I pay postage. WB2VTP, Don Nausbaum, 167 Loines Avenue, Merrick, N.Y. 11566. 516-MA3-5808.

KEYER SALE: Omega DA Digital Automatic I.C. Keyer (with DA-3 option) $65, postpaid. Mint condition. WB6YVW, 1755 N. Wilcox, Hollywood, Calif. 90028.

WRL's used gear has trial-guarantee-terms. SB300—$249.95; SS1R—$399.95; 75S-1—$299.95; Apache—$99.95; HA-10—$189.95; SX99—$89.95; G76—$79.95; 910A—$209.95; Thor V1 & AC—$149.95; HW12—$89.95; HW32—$89.95. New lower prices on hundreds more. Free "blue book" listing. WRL, Box 919, Council Bluffs, Iowa 51501.

FRESNO HAMFEST is May 3-4-5 and you shouldn't miss it. Advance registration is $8, including all the goodies and the banquet Saturday night. Code test, technical talks, mobile judging, transmitter hunts, Novice clinic, etc. At the Tropical Lodge, 4601 N. Blackstone, Fresno, Calif.

TRADE/SELL: NC-125, Heathkit RX-1, VF-1, D-104. Want: HAM-M, KWM-1 DC supply, mount, 312B-2 console, 30L-1/equivalent. Offers? K6SDE, 432 Rosario Dr., Santa Barbara, Calif.

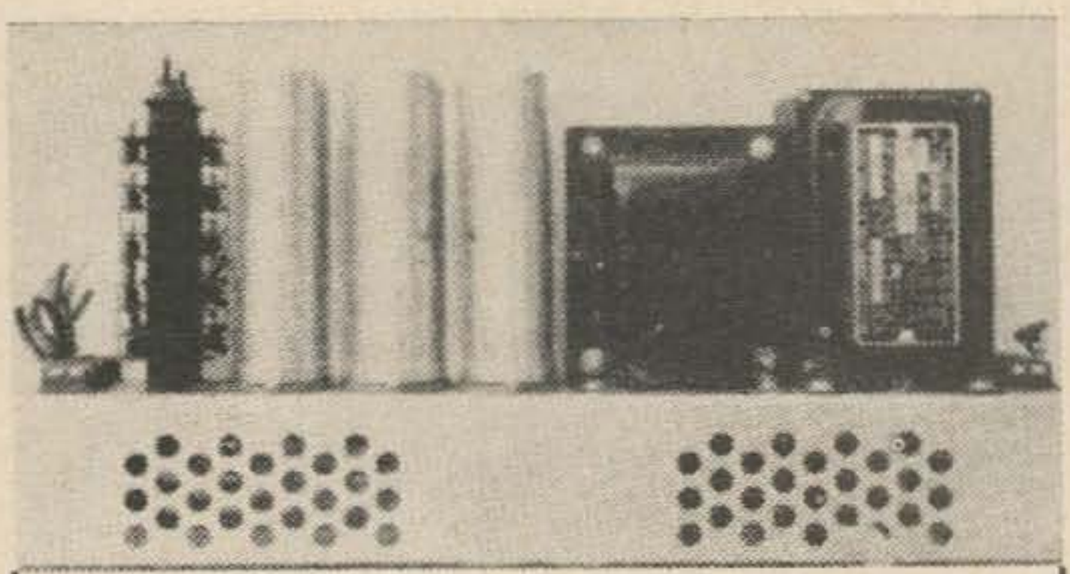
HAMMARLUND HQ-180, National HRO-60 with coils. Perfect. Sell one, $200 or best offer. Virgil Pfeifer, 1605 Gilbert, Peoria, Ill. 61604.

SELL OR SWAP: HT-37, FB for first SSB rig, $195. HX-11 Xmtr, FB for Novice. $35. David Brueni, R.R. 1, Dickinson, North Dakota 58601. CLEGG 99'er asking $65, Dumont 208B 5" scope with manual $70. Les Kalmus, K2SHL. 201 E. 18 St., Brooklyn, N.Y. 11226. 212-IN2-7250.

4-TRANSISTORIZED PROGRESS LINE GE mobile units, 150-174 Mc, 80 watt output complete with accessories like new, no junk! $450 each; 2—30 watt sets, $400 each; 2—50 watt base stations $375, 30 to 54 Mc 500 watt GE FM transmitter in 6′ cabinet with meters, uses pair of 4-125's. Meets present technical requirements if commercial use is desired $350. 2—150 Mc solid state voice Commander walkie-talkies with Nicad pwr supply $200 ea. KWS-1 unaltered & good shape—best offer in 30 days. W9DSV, Box 87, Webster, Wisc.

FOR SALE: Collins 75S-3C SN 10411 w/AM filter, 200 cycle crystal filter, Collins suitcase, all $575. H. Lund, RCA Antigua, Patrick AFB, Fla. 32925.

HEATH SB-301 in factory sealed carton after check and alignment. Never used $260. HQ-170C $185. D. Callaway, Rt. 1 Box 303, Durango, Colo. 81301.



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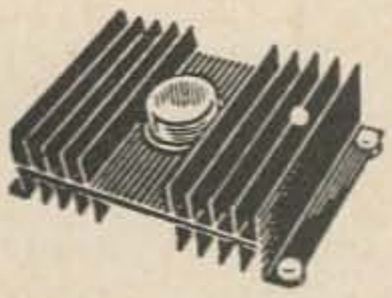

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IBM WIRED MEMORY FRAMES.

Removed from high priced computors. Exlnt condition.

160	core	**$ 4.00**
1,000	core	**10.00**
4,096	core	**12.50**
8,192	core	**15.00**
16,384	core	**35.00**

4X250 SOCKET w/chimney & plate ring. . .**$4.00**

29 VOLT 50 AMP DC REGULATED

Operate on 115 volt 60 cycle input with output of 29 volts DC 50 amps filtered and regulated. Solid state components with standard 19 inch rack panel mounting. Excellent condition. Shipping wgt. 175 lbs. **$75.00**

29 VOLTS DC 40 AMPS REGULATED

Same type power supply as above with lesser output of 40 amps. **$65.00**

1600 VOLTS DC 1.8 AMPS REGULATED

Solid state circuitry, 115 volt 60 cycle input, rack panel mounting, filtered with 0.5% ripple. Only a few of these on hand. Shipping wgt. 175 lbs. **$75.00**

1 AMP MIDGET SILICON DIODES

1000 PIV 35¢ each 12 for $3.50
1600 PIV 60¢ each 12 for $6.00

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All material FOB Lynn, Mass.

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19 ALLERTON ST., LYNN, MASS. 01904

3000 V @ 3μF brand new GE Pyronal oil capacitors $3 each. Can mail. 3-lbs each shipping wt., FOB P. Wandelt, RD # 1, Unadilla, New York 13849.

NATIONAL NC303, 6 meter converter, XCU-27 calibrator, mint condition, $275. Utica 650 Six meter transceiver, VFO, mike, $130. Richard Ravich, 10 Coolidge Road, Marblehead, Mass. 01945.

DAYTON HAMVENTION April 27, 1968—Wampler Arena Center, Dayton, Ohio, sponsored by Dayton Amateur Radio Association. QSO in person at the nations foremost radio event of the year. Technical sessions, exhibits, hidden transmitter hunt. Bring the XYL for an outstanding Ladies program. Join the satisfied participants who return year after year. Watch the Ham ads for information or write Dayton Hamvention, Box 44, Dayton, Ohio 45401.

DUMMY LOAD 50 ohms, flat 80 through 2 meters, coax connector, power to 1 kw. Kit, $7.95, wired $11.95, pp Ham KITS, Box 175, Cranford, N.J.

MECHANICAL ELECTRONIC DEVICES CATALOG 10¢ . . . Teletype Model 14 reperforator with automatic tape take up rewinder 115VAC 60cy. Both units new, unused $69.95 . . . ARR27 Receiver 29 tubes 465-510 MHz w/60 MHz if new, unused $35 . . . 1/16 laminated copper clad 2 oz. 2 sides, for printed circuits 9½x4½ $1 . . . 3/$2. Transistor boards bonzana $5.95 . . . Wide band balanced modulator $4.95 . . . 30 MHz IF Assembly $5.95 . . . Transmitter TDG w/Modulator easily converted to 2 meters $49.95 . . . Low pass filter 0-32 MHz 52 ohm $9.95 . . . 5KV/2KV/IKV at 750 ma/200ma/250ma Power supply write for details. Fertik's, 5249 "D", Phila., Pa. 19120.

THE NORTH JERSEY DX ASSOCIATION is sponsoring its annual DX Round-Up on Saturday, March 23, 1968. This is the Saturday following the IEEE Convention in New York and it is expected that many out-of-towners will find it convenient to attend. Site of the Round-Up is the Holiday Inn, Wayne, N.J. at the intersection of Route 46 and Route 23, just 30 minutes west of the George Washington Bridge. The afternoon program starts at 2 P.M. and banquet at 7 P.M. Further details available from W2PXR.

RTTY GEAR FOR SALE. List issued monthly, 88 or 44 MHy torroids 5 for $1.50 postpaid. Elliott Buchanan & Associates, Inc., 1067 Mandana Blvd., Oakland, California 94610.

MOTOROLA new miniature seven tube 455 kc if amplified discriminator with circuit diagram. Complete at $2.50 each plus postage 50¢ each unit. R and R Electronics, 1953 South Yellowsprings, Springfield, Ohio.

TOROIDS—DIODES—COAX—CONNECTORS. 88 mH toroids—45¢ each, 5/$2.00. 1000 PIV 1 Amp Top-Hat Diodes—55¢ ea., 2/$1.00. Connectors, PL259, SO-239, M359—45¢ ea. 10/$4.00. Button feedthroughs (while they last) 500 pF @ 500 V. 20/$1.00. Add sufficient postage. R and R ELECTRONICS, 1953 S. Yellowstone St., Springfield, Ohio.

VARIACS—General Radio and Ohmite, 60 cycles Input 120V—output 0-280 V. 1 amp or input 240 V—output 0-280 V. 2 amp. PULLOUTS IN GUARANTEED EXCELLENT CONDITION $6.95 plus postage. Shipping weight 10 lb. R & R ELECTRONICS, 1953 S. Yellowspring St., Springfield, Ohio.

DISCOUNT PRICES—Time payments, big savings on new equipment in Factory sealed cartons with full warranty. Swan SW-500C $445, SW-350C $365, SW-250 $286, National NC-200 $315, NCL-2000 $595, Galaxy V Mark II $365, Drake R-4B $375, T-4XB $375, L-4B $595, Ham-M rotator and indicator $99.95. All equipment new, full warranty, factory sealed cartons. Time payments on any purchase. No finance charge if paid within 60 days. Write for discount prices on Hy-Gain, Mosley, Tri-Ex, Hammarlund, New-Tronics, SBE. Immediate delivery. Reconditioned Specials 2-B $189, NCX-3 $199, 32V-2 $99, 75A-1 $129. Send for list. Bryan Edwards Electronics, 1314 - 19th Street, Lubbock, Texas. Phone 806-762-8759.

GENUINE FIBERGLASS CIRCUITBOARD. Over 250 Square Inches of .130 single and double clad, easy to cut. $2 postage paid. G. Beene, 1242 Coleman, Greenville, Texas 75401.

HALLICRAFTERS SX101A Receiver $150. Heath HO-10 Monitor scope $50. Hallicrafter HA6 transceiver & PS supply $125.00. All in excellent condition. Must sell soon. Wilbur Orr, 97 Green-Clover Dr., Henrietta, N.Y. 14467.

HEATH DX-100 with book $80; National NC-190 receiver, perfect, original carton, look, $175. Both $225. K3BGZ, Rt 2 Box 20-A, Leonardtown, Md. 20650.

KITS WIRED AND ALIGNED: Transmitters - receivers - amplifiers - anything; Rate—thirty percent of kit price. Carey Cranford Coggins Industrial Laboratories; 7235 Hunters Branch Drive, Atlanta, Georgia.

NATIONAL NCX-3, NCXA ac supply, like new, original carton, manual, first $250.00 gets it shipping paid. Eugene Gossett, 762 Maple St., Spartanburg, S.C. 29302.

JOHNSON INVADER like new, Tapetone Rcvr converted Valiant command sets, send for list. Thomas, 11 Sussex North, Lindsay, Ontario, Canada.

SWAN 250 AC DC power used 3 times vox calibrator 444 mike $450.00 delivery 250 miles. John Oezer, P.O. Box 97, DeMotte, Ind. 46310.

GROUNDED GRID FILAMENT CHOKES, 30 AMPS, Ferrite core, Bifilar wound, $4.00. Plate chokes 800mA. $2.00. PPUSA48, Calif. add tax. William Deane, 8831 Sovereign Rd., San Diego, Calif. 92123.

SELL TWO NEW PHILCO CLR-6 Microwave Repeaters $400.00—Tektronix Model 517 Oscilloscope with powed supply. Good condition. $275.00—Hewlett Packard Model 505B Electronic Tachometer Indicator. $40.00. Good condition. All above with manuals. Brice Benson, 2046 N. Adams, Indianapolis, Indiana 46218.

SELL: Telesig 301 transmitters, 302 receivers 42 cycle shift, with matching plugs and mercury polar relay. Make offer. No dealers. KL7OK/KH6, P.O. Box 291, Wahiawa, Hawaii 96786.

SB-300 & SB-400 $535. New condition with HS-24 speaker. W6TRU, 5226 Vickie Dr., San Diego, Calif. 92109 Phone, AC714-488-8673.

ITA COMMUNICATIONS SYSTEM, new. Built for FAA. Transmitter, receiver, solid state P.S., Harmonic filter, and remote control unit. Crystal controlled 118 to 152 Mc. 50 watts AM output. With instruction books. Paul Moffitt, W3HMR, 222 Sherbrook Blvd., Upper Darby, Pa. Call (215) CL9-4692.

GONSET GSB-6 SSB (6 meter transceiver) w/AC pwr sup. 2 Mo. old—w/manual, $295.00. NC-303 Converters, 220, 144, 50 Mc in matching cabinet, $75.00. W1VYB, 922-3850.

WANTED: Gonset 2 meter linear, II or III. W1VYB, 922-3850.

FRESNO HAMFEST, May 3-4-5 at the Tropicana Motel, 4061 N. Blackstone, Fresno, Calif. Tickets $8 until April 27th, include registration, banquet, etc. Send to Box 783, Fresno, Calif. 93721.

WANTED: Military, commercial, surplus Airborne, ground, transmitters, receiver, testsets accessories. Especially Collins. We pay freight and cash. Ritco Electronics, Box 156, Annandale, Va. Phone 703-560-5480 collect.

GALVANOMETERS/METER RELAYS, New Weston #705, 0-10 microamps full scale or 5-0-5 microamps by shifting zero adjustment. $5.50 ea. Postpaid. Glen Richie, Box 26 Salem, Virginia 24153.

WE PAY CASH FOR TUBES

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SILIC. RECTIF. 8000 PIV 400 MA. Large user's termin. invent., not rejects! Slater SLA08-2. Max: reverse, 2 uA; fwd drop, 8.2 v. Cost $8 ea.
Bakel. encapsul. 3x3½x1" ht oa. **PAIR Postpaid** **$5.30**

MARCONI FM DEVIATION METER TF-934, regularly $890. Reads dev. w/ranges 5, 25, 75 kc. Has audio monitor. Made for MIL, 2½-100 mc, easily reaches 1000 mc on harmonics; we include all instructions.
Checked out, ready to use. **$249.50**

Brand New VHF rcvrs look like BC-453 Command but are 9-tube 108-135 mc. 2 uv sens., 2 rf's, 3 IF's; nosie lmtr; avc. W/schem., instruct., spline knob, & graph to set freq. by counting turns. **A.R.C. Type 13B,** 28v htr wiring; 7# shpg. wt. **$22.50**
R32 is same but w/squelch; 14v htr wiring $27.50

R-23/ARC-5 Command rcvr 190-550 kc. 14.95
A.R.C. 12 #22 Command rcvr 540-1600 kc..... 17.95
LM-14 freq. meter, .01% 125 kc-20 mc 57.50
TS-323/UR freq. meter 20-480 mc. .001% 169.50
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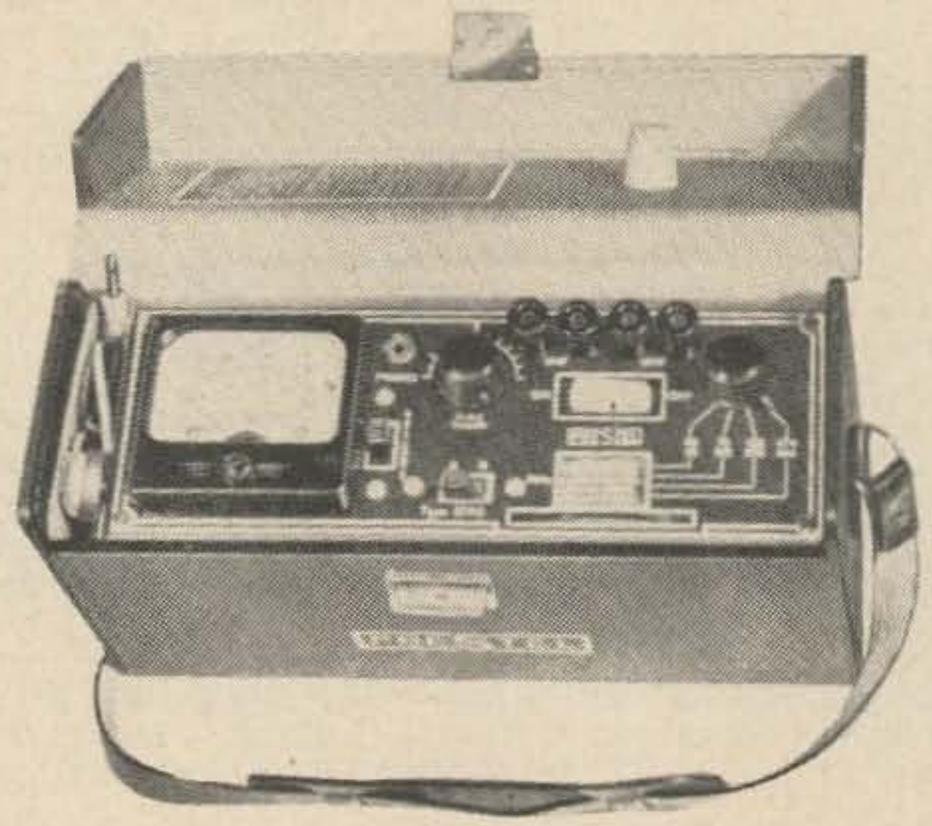

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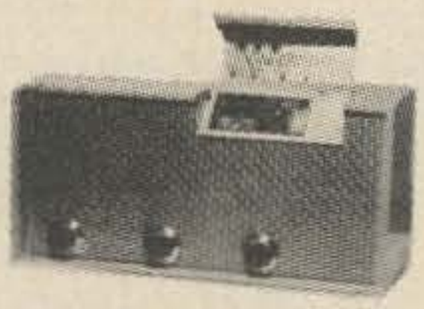

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INDEX TO ADVERTISERS

Adirondack, 80
Aerotron, 79
Amidon, 41
Arcturus, 88
Arnolds, 82
ATV Research, 67

BC Electronics, 82
Bigelow, 81

Callbook, 90
Columbia, 73
Crabtree's, 15

Dayton Hamvention, 4
Deltatron, 83
Devices, 82
Dupage FM, 47
Duratower, 69
DXer Magazine, 80
DX Handbook, 47
Dymond, 31

Editors & Engineers, 62
Edwards, 5
Epsilon Records, 57
Evans Radio, 59

Fair Radio, 96
Freck, 90

Gain, 89
Galaxy, Cover 3
Glass, 23
Goodheart, 95
Gordon, 57
Gotham, 69

Hafstrom BTI, 67
Hayden, 87
Heath Company, 57
Henry Radio, 63

International Crystal, Cover 4

James Research, 56
JAN Crystals, 65
Jefftronics, 90

Leger Labs, 77
Leeds, 90
Lewispaul, 95
Liberty, 96
Lincoln, 10
Linear Systems, 49

Main Electronics, 89
Meshna, 94
Military, 73
Mission, 26
M & M, 81
Mosley, 47

Newtronics, 3

Omega Electronics, 83

Palomar, 80
Parks Labs, 70
Polygon, 40
Poly Paks, 75

Quement, 19, 21

Radio Callbook, 90
R & R, 89
RTTY Printer, 87

Salch, 27
San Antonio Convention, 74
Scott, 68
Sentry, 43
Skylane, 78
Slep, 84
Sound History, 30
Swan, 28, 29

TAB, 92
Telrex, 25, 48
Tri Rio, 61
Tristao, 72
Tuck, 81

UKW, 81
United Radio, 76
Unity, 89
US Crystals, 81

Vanguard, 4, 55, 68, 72, 84
Virden, 45

Westcom, 83
WRL, Cover 2

73 DX Handbook, 81
73 Data Handbook, 56
73 Diode Handbook, 62
73 World Globe, 81

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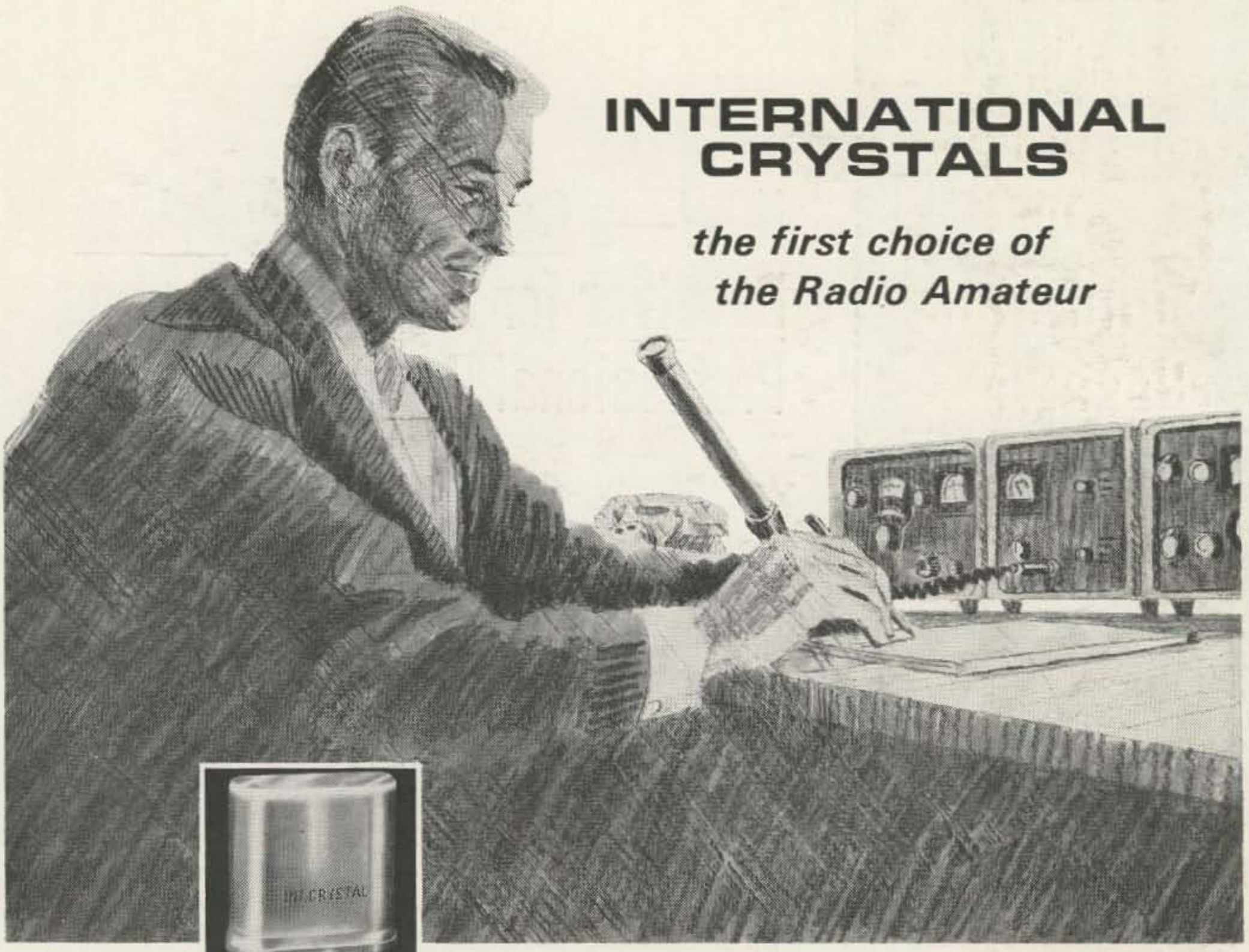

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